

WOMEN'S DAY

1-15 MARCH, 2024

Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

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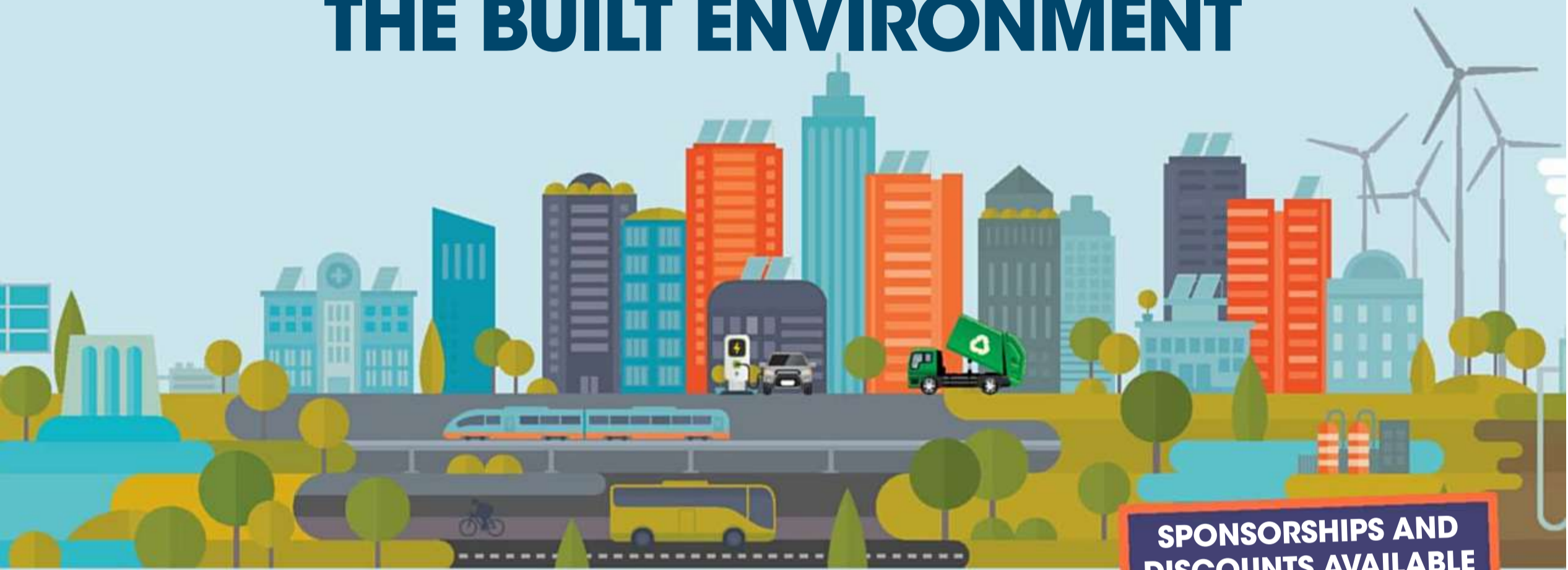
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The rapid urbanization and population growth in developing economies have fuelled a construction boom. India's buildings and construction sector is responsible for about a third of the nation's energy use and related CO₂ emissions. The sector is expected to nearly triple the energy use and quadruple the emissions by 2050 as the country estimates to add 21.5 billion sqm of building space by 2040 which is dominated by residential buildings. At this juncture, it is crucial to build wise and prevent hefty carbon lock-in.

Decarbonizing strategies require address to both operational and embodied energy which contribute nearly equally to emissions in a comprehensive outlook – an ecosystem approach. While India has been addressing the operational energy with renewable offsets and standards and codes like Energy Conservation Building Code 2017 and Eco Niwas Samhita 2018, efforts for reducing embodied energy and carbon have just begun. For instance, Building Material and Technology Promotion Council has released a compendium of indigenous materials and technologies. Efforts are now needed to mainstream such materials.

Embodied energy and carbon reduction involves two key strategies: low-carbon design and construction, and low-carbon material options which further involve responsible sourcing as well as production. Processing of construction and demolition waste and use of recycled materials can enable this to a great extent. Addressing these aspects is crucial for achieving India's net-zero commitments by 2070.

CSE's Anil Agarwal Environment Training Institute (AAETI) offers a residential course aimed at providing comprehensive knowledge on decarbonizing the built environment. This course will familiarize practitioners on low-carbon materials, design and construction, recycling of materials, current market trends, existing gaps between policy interventions and ground realities, and strategies for adopting a net zero approach in the construction sector. AAETI is a sustainable, state-of-the-art campus, designed to serve as a learning tool for sustainable building concepts and design practices.

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FOR FURTHER DETAILS, PLEASE CONTACT

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Rethink the way we grow food

THERE IS something fundamentally broken in the world's agricultural system when you see images of rich European farmers and their poorer counterparts in India straddling tractors to block highways to make their anger heard. The fact is that these farmers are enjoined across continents with a serious problem of increased cost of agricultural production in an age of climate risk and losses.

In Europe, the flashpoint ironically was the introduction of the climate regulation, under which farms would be required to halve pesticide use; cut fertiliser use by 20 per cent; double organic production; and leave more land for non-agricultural use for biodiversity conservation. In addition, the Netherlands had proposed to reduce its livestock numbers to cut nitrogen pollution and Germany to slash its subsidy on diesel, a fossil fuel. All this is clearly needed in a world faced with the existential threat of climate change. Agriculture in the EU, as in other parts of the world, contributes significantly to greenhouse gas emissions—one-tenth of its annual emissions. If this cost of abatement is high for rich farmers, what will it do to farmers in our world who are at the margins of survival?

The fact is that the European farming system, which epitomises modern agriculture as we know it today, has survived because of massive subsidy. Since 1962, the EU's Common Agricultural Policy (CAP) has provided financial support for agriculture—after much criticism, the support was brought down but only marginally. Today it constitutes some 40 per cent of the EU budget and involves direct payments to farmers. Each farmer, according to the European Commission data, received €6,700 annually (roughly ₹50,000/month) in 2021 as direct income support. Over and above this, there is more investment made to facilitate agriculture.

Over the years, the “nature” of farming has evolved; farms have become larger and more consolidated. Small agriculturists now struggle to survive because of increased input costs, higher standards and bureaucracy. Larger farms are also faced with high debt as costs increase. The practice of organic farming—today 10 per cent of EU land is under this system—has been designed to increase the cost of cultivation. Farming has responded by becoming more intensive—more productivity per crop or livestock—and this means more use of chemicals and inputs, which combined with environmental conditions, results in even higher costs. This spiral of costs is then faced with two realities—one, the need to keep

consumer prices of food under control and two, growing crop damages because of climate exigencies.

This is the system of intensive agriculture that is feted in the world—it is touted that environmental standards can be built into the system and yet farmers can increase production and make the business work. Clearly, this is not the case. The cost of food is not affordable even in countries of the western world. The environment is not protected.

In India, farmers protesting on the doorstep of Delhi want higher minimum support price (MSP) for their produce. They face the same challenges as their counterparts in rich Europe, but without the massive subsidy to support food cultivation. Then they face a pincer attack—government has to procure food for distribution and so it needs to keep the price under control; consumers (all of us) do not want to be hit by food inflation. So, even as farmers struggle to make ends meet in terms of costs and increased risk because of weather and pest attacks, and every time the food price goes up and they could benefit, the option is to cool down prices through cheaper imports. They lose. They cannot then invest in the improvement of soil, water or biodiversity. In this system, the only way ahead is to discount the cost of environmental safeguards.

They are now being told that they need to increase productivity to stay profitable. But this comes at a higher cost because of expensive inputs—this food economics makes no sense as the higher costs will not be paid for in a country that needs affordable food. It is clear that the Indian government cannot subsidise individual farmers at the scale of Europe. It is also clear that even this whopping financial support would not be enough in this system of intensive agriculture.

So, we need to discuss how to reduce costs of cultivation and yet put money on the table for farmers. This is where regenerative or natural farming will play a role, but at scale and with great policy and deliberate practice and science to back it. We also need food procurement policies to work at the local level, so that farmers get assured markets for good food. The Odisha government's millet procurement for mid-day meals is one such practice. The fact is, the world has enough food to feed people; the problem is that much of this food is going into feeding livestock or just to waste. This is what needs to be addressed. [DTE](#) [@sunitanar](#)

We need to discuss how to reduce costs of cultivation and yet put money on the table for farmers

DownToEarth

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PROGRAM ON**

ENERGY AUDIT AND MANAGEMENT

Dates: March 12-23, 2024

Last date to apply: March 7, 2024

PARTICIPANTS WILL BE AWARDED "CERTIFICATE OF COMPLETION" ONLY ON SCORING 50% MARKS IN THE CLASS EXERCISE

Countries are actively discussing setting up targets for doubling energy efficiency by 2030. As an emerging economy, India also continues to scale climate mitigation efforts. The country's manufacturing industries and power sector together contribute more than 85 per cent of our total GHG emissions, along with contributing to the poor air quality in Indian cities. Concurrently, Indian companies are also coming up with net-zero targets.

This necessitates the need for energy management and optimization in industries/ organizations to reduce fuel consumption and subsequent costs incurred from energy consumption and carbon emissions. An energy audit is a tool that helps industry/ organization/commercial buildings like hotels optimize energy use, identify energy losses and take opportunities for emission mitigation.

In this regard, the Centre for Science and Environment (CSE) is organizing a 12-days online course designed to offer a thorough understanding of energy management and auditing and its various elements. The training aims to enable professionals to not just reduce energy costs but also improve the overall environmental performance of the entity. With the skill set provided in this training, an energy professional can assist the entity in preparing a roadmap that will help them to be one step ahead in energy efficiency, emission reduction and the country's overall climate ambition.

LEARNINGS FROM THE PROGRAMME:

- Energy efficiency and climate change, understanding GHG emission mitigation
- Understanding the fundamentals of energy management and audit
- Data collection, auditing and management with sector-wise case studies
- Analysing energy consumption in a facility and establishing energy balance
- Performance assessment of different electrical and thermal utilities
- Understanding the features of energy consuming systems and energy savings opportunities

COURSE FEES

₹3,500 (For Indian Participants)
US\$ 100 (For Global Participants)

WHO CAN APPLY

- Government officials
- Representatives from industries, commercial buildings like hotels
- Academicians, researchers, consultants and professionals working on the issue

MODE OF TRAINING

The course is designed in a manner such that participants can attend it along with their regular work. The course will be conducted on the Moodle Platform where participants will be provided with reading / audio-visual training material which they are expected to self-study at their own convenience. Live online sessions will be organized with experts for Q&A and further discussions. The course material will be for 12 days with a duration of 2-3 hrs/day.

**TO REGISTER SCAN
THIS QR CODE**



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Engage



Time to turn to millets

The cover story "Rice and wheat have lost nutrients" (16-31 January, 2024) was quite informative. I believe that the findings on poor nutritional value of various wheat and paddy varieties are a boon in disguise. These grains are staples across the length and breadth of India. Now that we know they have lost their nutritional value, we can substitute them with different varieties of millets.

Millets are more nutritious and easy to grow. The crops also consume less water for production, are more resistant to diseases and better suited for all climates. Farmers also see good income for millets.

The fallacy that millets are the food of the poor while rice and wheat are for the rich should be removed from the elite minds of Indians, as must the belief that millets are consumed more in rural areas than in urban cities. Ready-to-eat millet-based foods like batter for *ragi dosa*, *pongal* and *upma* are now available everywhere. These can be popularised to promote more consumption and demand for millets.

I request you to work on an edition highlighting the importance and relevance of millets for all rural and urban Indian households.

SHYAMALA BHUVANACHANDRAN.
VIA EMAIL

A condition to be understood

This is with regard to the article "That lonely feeling" (16-31 January, 2024). As a teenager discovering social media, I found many of my classmates and friends describing themselves as "lonely" on their online profiles. It was a huge revelation, as for a long time, I failed to fathom that even people surrounded by friends could feel lonely.

Loneliness is often "weaponised" by cultural expectations to find a spouse, have children or forge friendships. This can be traced back to the belief that only those with "serious" issues seek help or therapy; loneliness can be cured through socialisation. But as the article highlights, the COVID-19 pandemic has derailed people's mental health by disrupting the typical ways of social connection. Now, we need to think about a cultural shift in addressing loneliness to help people.

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Digest

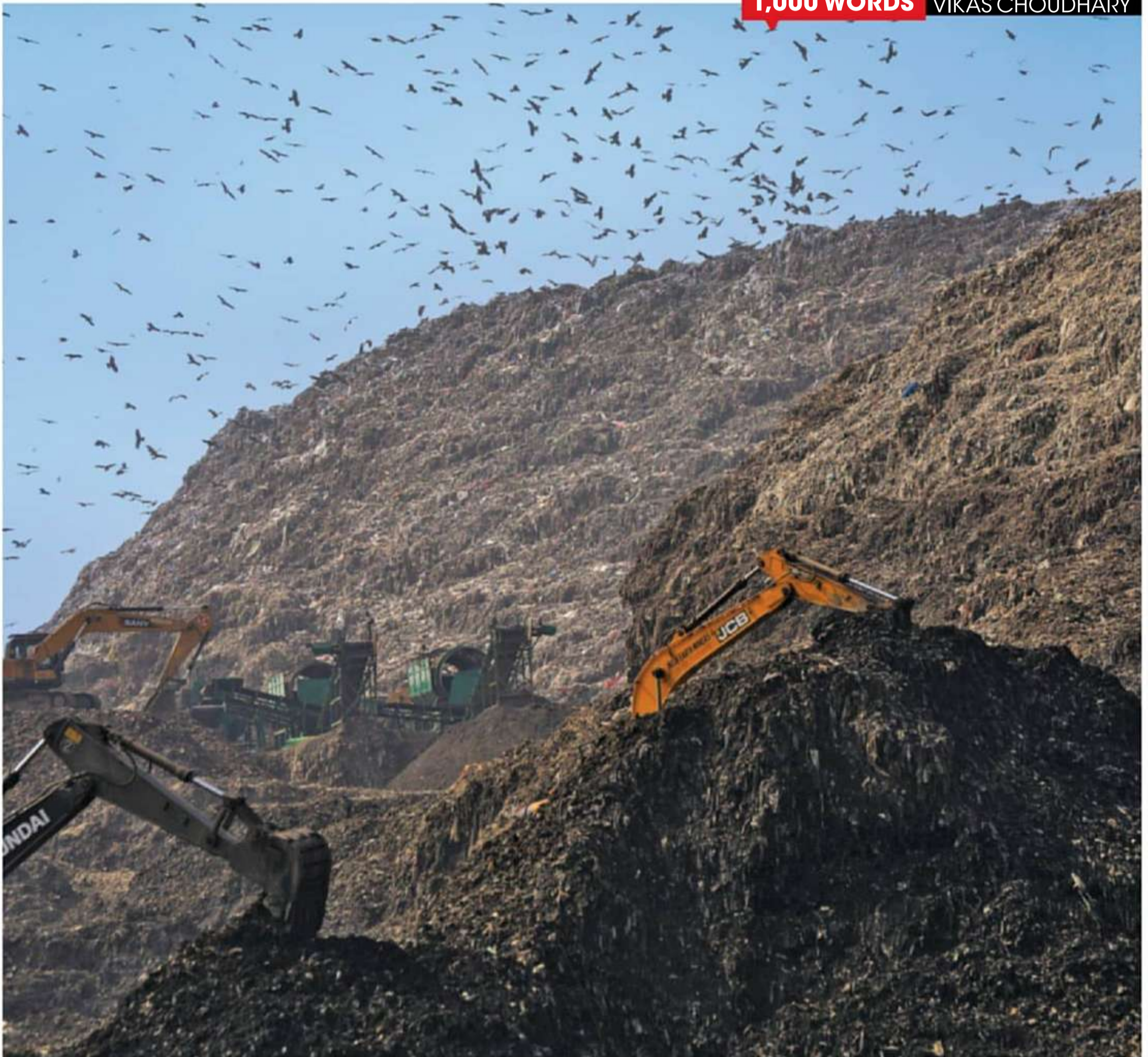
WHAT'S INSIDE

Odisha forest dwellers give delicate twist to siali creepers, improve their lot **P10**

Year begins with warmest January on record **P11**

New method to detect forever chemicals **P12**

1,000 WORDS VIKAS CHOUDHARY



The landfills of Delhi such as Ghazipur waste site, pictured above, are responsible for major leaks of potent greenhouse gas methane. The national capital has, in fact, recorded 124 methane super-emitter events from its landfills since 2020, says *The Guardian*, based on analysis of data by UK-based company Kayrros, which uses satellite imagery to measure the footprint of human activity on the environment. According to the analysis, 1,256 super-emitter events have occurred between January 2019 and June 2023 worldwide, with Pakistan, India and Bangladesh leading the list for most large leaks, followed by Argentina, Uzbekistan and Spain.

FOR MORE PHOTOS, SCAN



Twist in tradition

TREKKING THROUGH the deep forests of Similipal to collect siali creepers (*Bauhinia vahlii*) is no easy task. Extracting its inner bark and weaving the fibre into strong ropes as well as delicate handicrafts is another arduous chore. But it brings cheer to Sashi Mankirdia, a 52-year-old resident of Kendumundi village in Odisha's Mayurbhanj district. Over the past few years, she has managed to get her three daughters married and substantially augment her income by making not just siali ropes, but also siali bags, baskets and other handicrafts.

Around 2,000 families like Sashi's, most of whom belong the Particularly Vulnerable Tribal Group (PVTG) Mankirdia, in Mayurbhanj and Keonjhar districts of Odisha are now benefiting from handicrafts made of siali. Also known as the "maloo" creeper, the plant is a key non-timber forest produce (NTFP) of the state. While its leaves are stitched to make plates, both for household consumption and selling, the fibres are traditionally used to make ropes to tether animals, hang pots or make fences around their houses to keep wild

Tribal families in Odisha make delicate handicrafts from heavy-duty siali creepers

ASHIS SENAPATI



animals, including elephants, at bay. But the ropes were rarely marketed and did not provide much income opportunities.

This has changed since 2012, with the families learning how to make baskets, table mats, bags, flower pots, wall hangings, bowls and several other items using the siali fibre. "These items made from siali creepers are in demand, as they are eco-friendly, biodegradable and reduce the use of plastic," says Debashis Prusty of Hill-Kharia and Mankirdia Development Agency (HKMDA). The agency, established under a state government micro project for the development of the Hill Kharia, Mankirdia and Birhor PVTGs, facilitates training of the families in making the siali handicraft items. "A lot of the craftspersons are elderly, who have been traditionally working with siali. But now whole families work together," adds Prusty. Pandu Mankirdia, a 58-year-old resident of Durudura village in Mayurbhanj district, says, "I started weaving siali baskets, chairs, flower pots and other items for good money six years ago. We do not need a lot of investment, as the raw material is abundantly available in forests."

Initially, the communities sold the items to local traders and the Odisha Rural Development and Marketing Society (ORMAS), a government-run organisation. However, as the former would rake up huge profits leaving the craftspersons with little to no earnings, they began to deal only with ORMAS. The body now organises craft *melas*, fairs and *haats* across the country, where the craftspersons can display their wares. Most of them earn ₹4,000-8,000 a month as additional income. Pandu says more than earnings, the handicrafts-making helps pass on traditional knowledge of collecting and working with siali from generation to generation.



EXTREME WEATHER

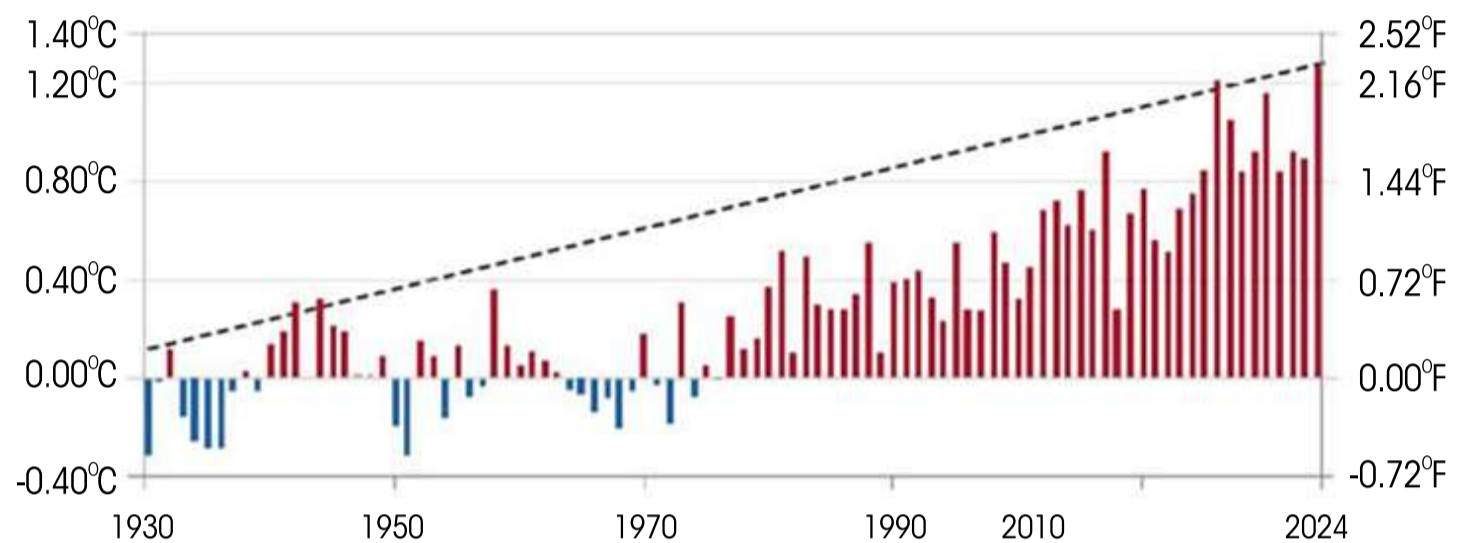
January 2024 warmest on record

THIS JANUARY was the warmest on record since 1850, with global surface temperature 1.27°C above the 20th century average of 12.2°C, as per the US National Oceanic and Atmospheric Administration (NOAA). The month was also the second wettest recorded, says data with NOAA's National Centers for Environmental Information.

In terms of sea ice at the poles, Antarctic sea ice extent was the fourth-lowest on record during the month. On the other hand, the Arctic sea ice extent appeared to approach its annual maximum, which usually happens in March, says the US National Snow and Ice Data Center.

Hotter start

January temperatures appear more than normal over the past five decades



Source: "January 2024 Global Climate Report", National Centers for Environmental Information, US

January's warming records are a continuation of trends being seen since June 2023, possibly due to strong influence of El Niño. NOAA

predicts that the global climatic pattern is likely to shift towards cooler La Niña conditions by June or August this year.

CLIMATE REGULATION

EU sets out new emission reduction targets for 2040

THE EUROPEAN Commission on February 6 recommended that the bloc cut its net greenhouse gas emissions by 90 per cent by 2040, compared to 1990 levels. The target serves as a bridge for the EU's earlier goals to cut emissions by 55 per cent below 1990 levels by 2030, and net zero emissions by 2050. The 2040 target outlines a roadmap for near-complete phaseout of coal by 2040, along with a rapid decline in use of natural gas. However, while an earlier draft of the goal had strong emission reduction measures for the agricultural sector, the final version pulled back, focusing on efforts by all sectors. This appears to be a result of recent protests by farmers across the EU against policies they deem harmful. Further, the goal heavily depends on the use of carbon capture usage and storage and carbon dioxide removal technologies, which are still in the nascent stage. The goal also falls short of demands for stronger targets from the EU as a historical emitter. According to Climate Action Tracker, the bloc should reduce emissions by 65 per cent by 2030 and at least 95 per cent by 2040, to help limit global warming to 1.5°C.

AGRICULTURE

Farmer protests continue with demand for MSP

DESPITE FOUR rounds of talks until the third week of February, the Union government and farmer leaders failed to reach an agreement on the latter's demand for guaranteed minimum support price (MSP) for 23 crops. The protest began on February 13, with hundreds of farmers marching towards Delhi in demand for legal guarantee for crops. During discussions on February 18, the government proposed that its agencies would enter into five-year contracts with farmers for purchase of pulses, cotton and maize at MSP without quantity limitations. However, farmer leaders rejected the proposal, saying it would only help farmers who switch to other crops from paddy. Further, the proposal does not factor in the farmers' demand to change the calculation of MSP to account for the rental value of owned land and interest on fixed capital, along with the cost of production and family labour that is currently considered. At the time of this edition going to press on February 21, the farmer leaders had decided to continue with their march to the capital.

QUERY

Detect PFAS in three minutes

1 What are PFAS?
PFAS or per- and polyfluorinated substances are human-made compounds found in a range of commonly used items, from food packaging to water-repellent clothing. These compounds are also called "forever chemicals" because they take thousands of years to degrade, and are linked to cancer risks. Thousands of PFAS could be present in soil and water, but their distribution remains unknown.

2 How are these compounds detected?
A common method to detect PFAS in water or soil samples is separating their molecules using liquid chromatogra-

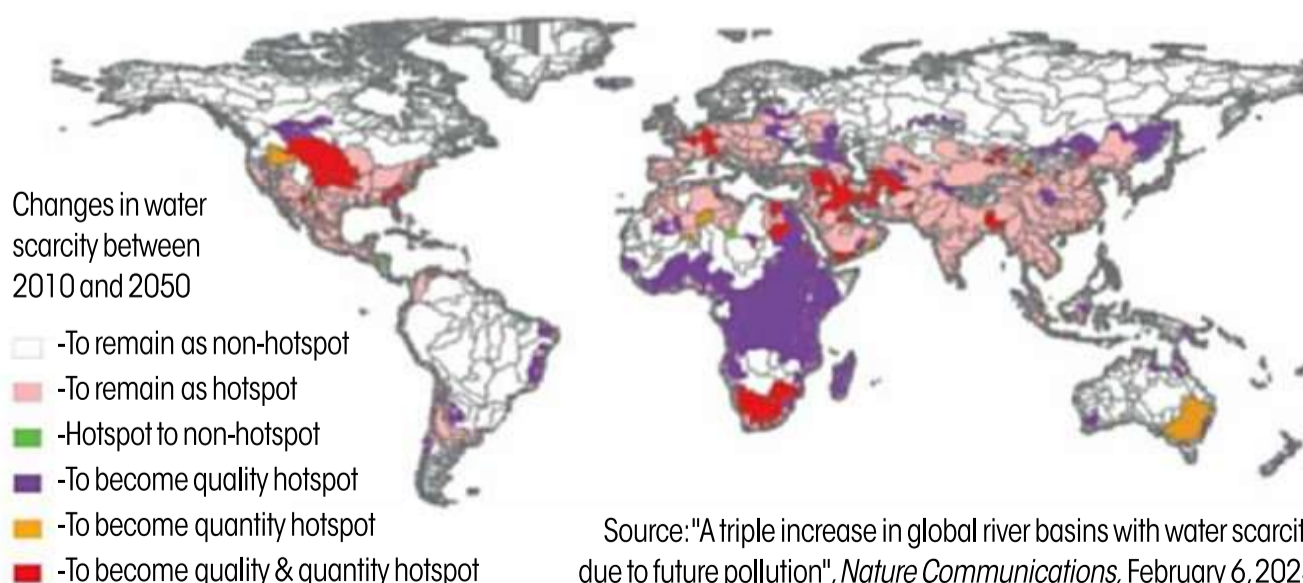
phy and then detecting and quantifying them using mass spectrometry. However, this method is costly and time-consuming, claim researchers with the New Jersey Institute of Technology, US. They have created a faster way of detecting PFAS using paper spray mass spectrometry. This method allows PFAS to be ionised and analysed. The researchers claim that they have detected several different PFAS from food packaging, water and soil in under three minutes using this method.

3 How will this faster method help?
The researchers say this could significantly speed up study of bioaccumulation of PFAS in the environment. They could also help in monitoring standards for packaging of consumer products.

TRACKER

Nitrogen pollution could **triple water scarcity** in river sub-basins worldwide by 2050. This means that an additional **40 million sq km** of river basin area and **3 billion more people** may face water scarcity in 2050 due to nitrogen pollution, a concern that emerged in 2010. In India and Africa, which could become hotspots of scarcity, **sewage** emerges as biggest contributor of nitrogen pollution in water in the worst climate scenario.

Water scarcity hotspots in a future scenario with high urbanisation, fossil-fuel use and low-ambition policies to reduce nitrogen and mitigate climate impacts



BITS GLOBAL

US recorded the world's first death due to Alaskapox, a viral disease related to other pox viruses. The patient was an elderly resident of Alaska undergoing cancer treatment, and may have been compromised immunity, leading to severe illness. Alaskapox is a relatively new disease, with only six cases of mild illness recorded since 2015. Its symptoms include rashes, swollen lymph nodes and joint or muscle pain.



Trinidad and Tobago reported a massive oil spill on February 7, as a mysterious vessel capsized near its coast, prompting the government to call a national emergency. The spill, as of February 15, had spread 12 km into the Caribbean Sea. With the leak from the vessel still unplugged, it risks the waters of the Caribbean Sea up to northern Venezuela as well as coral reefs around Trinidad and Tobago's shores.

Thailand on February 15 reported that the pollution levels in its capital Bangkok and surrounding provinces had hit unhealthy levels. It also ordered government employees in the capital to work from home and encouraged limited movement of people and vehicles. The pollution, caused by crop-related burning, industrial pollution and heavy traffic, made Bangkok the eighth most polluted city in the world that day.

China in mid-February conducted its first review of scientific paper retractions and research misconduct, asking universities to submit to the government a comprehensive list of all academic articles retracted from English- and Chinese-language journals over the past three years. The self-review comes in the wake of Hindawi, a London-based subsidiary of the publisher Wiley, retracting more than 8,000 papers by Chinese authors.

BITS INDIA

The Union Ministry of Consumer Affairs, Food and Public Distribution on February 8 tightened some wheat stock holding norms to check hoarding and rise in prices. Traders and wholesalers must now maintain wheat stock up to 500 tonnes instead of 1,000 tonnes, while big-chain retailers can hold 5 tonnes in each outlet and a total of 500 tonnes. Processors must maintain 60 per cent of their monthly installed capacity multiplied by the remaining months till April 2024, instead of the earlier 70 per cent.

Nearly 3,000 fish died in Jammu and Kashmir's Samba district in early February. According to officials with the Mansar wildlife department in the district, the fish may have died due to the consumption of hailstones during precipitation in the region. Authorities have begun cleanup drives to dispose of the dead fish.



Karnataka reported over 50 cases and two deaths due to Kyasanur Forest Disease (KFD), a tick-borne viral haemorrhagic fever, since early February, according to state health officials. KFD is transferred to humans either through monkeys, livestock, shrews and rodents with infected ticks or directly through tick bites. The outbreak this year across Uttara Kannada, Chikkamagaluru and Shivamogga districts could be due to decreased rainfall, allowing ticks to spread. Authorities say this recent surge is part of a larger trend of cases peaking every four to five years since 1957, when KFD was first identified in the Kyasanur Forest in Shivamogga district.

The Maharashtra health department will initiate a pilot vaccination drive this March against Japanese Encephalitis for children in Pune city, Pimpri-Chinchwad, Raigad and Parbhani. Five million children aged 1 to 15 years will be vaccinated for free against the viral, mosquito-borne disease that causes fever, nausea and seizures.

POLICY FRAMEWORKS

- The Union Ministry of Environment, Forest and Climate Change has issued the **Draft End-of-Life Vehicles (Management) Rules, 2024**. These rules aim to establish regulations for extended producer responsibility for end-of-life vehicles and outlines guidelines for managing such vehicles in an environmentally sound manner.
- The Rajya Sabha has passed the **Water (Prevention and Control of Pollution) Amendment Act, 2024**. The Act decriminalises several violations regarding water pollution, and introduces penalties instead. It will initially apply to Himachal Pradesh, Rajasthan and the Union Territories.
- The Goa government has introduced the **Goa Land Use (Regulation) Bill, 2024** to facilitate the use of tenanted land for setting up of projects for community or public purposes.

IN COURT

NATIONAL GREEN TRIBUNAL

■ In a case alleging environmental violations such as encroachment of a waterbody in Nuh district, Haryana, for a road construction project, the National Green Tribunal (NGT) has ordered the National Highway Authority of India (NHAI) to pay ₹45 crore as compensation.

■ Taking cognisance of a *Down To Earth* article on illegal sand mining on the Sone river, Bihar, NGT issued a notice to state authorities to respond on the matter. The authorities have filed a reply that some action (arrests) has been taken.

■ In a case on disposal of industrial effluents through stormwater drains in Muzaffarnagar, NGT told the Uttar Pradesh pollution control board to ensure all treated effluent is utilised by the industry for irrigation. The board must also monitor water quality and set rules for fly ash disposal.

SUPREME COURT

■ The apex court has proposed the formation of an expert committee to decide the future of Vedanta's Sterlite Copper plant in Thoothukudi, Tamil Nadu. The committee would determine whether such a plant may operate in this region and what environmental norms it should follow.

■ In a case on illegal dumping of solid waste by the Maan Gram Panchayat in Pune, the local governing body told the Supreme Court that all the waste has been removed as per earlier orders by NGT. The court has asked the Maharashtra Pollution Control Board to verify the claims.

HIGH COURT

■ While hearing two pleas on menace caused by stray dogs, the High Court of Jammu and Kashmir and Ladakh asked for a report on implementation of Animal Birth Control Rules, 2023 in the Union Territories.

So far...

Number of cases on environment and development tracked from January 1 to February 15, 2024

NATIONAL GREEN TRIBUNAL	SUPREME COURT	HIGH COURTS
74	13	12

FOR DETAILED VERDICTS, SCAN





BIG NUMBER

\$2 trillion

needed as annual investment from 2024 to 2030 to triple global renewable energy capacity by the end of the decade, a goal agreed to at the 28th Conference of the Parties to the UN Framework Convention on Climate Change

Source: "Tripling renewables by 2030: Interpreting the global goal at the regional level", Climate Analytics

VERBATIM



"WE ARE BREAKING DOWN SILOS TO MOVE THE NEEDLE ON THE ENVIRONMENTAL CHALLENGES"

CARLOS MANUEL RODRÍGUEZ

Chief executive and chairperson of the Global Environment Facility (GEF). At the 66th GEF Council meeting in early February, its 186-member governments agreed to invest \$1.1 billion for action on biodiversity, climate change, nature renewal and pollution control. The event coincided with the first meet of the Global Biodiversity Framework Fund (GBFF) Council. Delegates set down rules for the implementation of GBFF, designed to mobilise investment for protection of biodiversity.

THE/NUDGE Prize



DCM SHRIRAM
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Upgrading Soil with Biotechnology to Save Water

When we think of India's water crisis, we automatically think of aquifers being drained by borewells. However, solving the problem requires us to shift our focus from below the ground, to the soil beneath our feet, which is where India's water crisis starts and ends.

India now has surplus food production, but the dark side of this food security is the severe degradation of our soil, primarily due to the use of fertilisers, pesticides, and other chemical inputs aimed at increasing yield. The more we used them, the more we needed them, leading to a vicious cycle that trapped smallholder farmers without enough income to sustain themselves, and simultaneously depleted freshwater reserves for everyone. This situation is largely due to a complex ecosystem involving MSPs (Minimum Support Prices) and market forces. These factors incentivise farmers to cultivate water-intensive crops, while a subsidised yet erratic power supply leads them to water their crops based on electricity availability rather than the crops' actual water needs. Efforts to change this system inevitably lead to pushback, because smallholder farmers simply cannot sustain themselves while we make such long-term fixes.

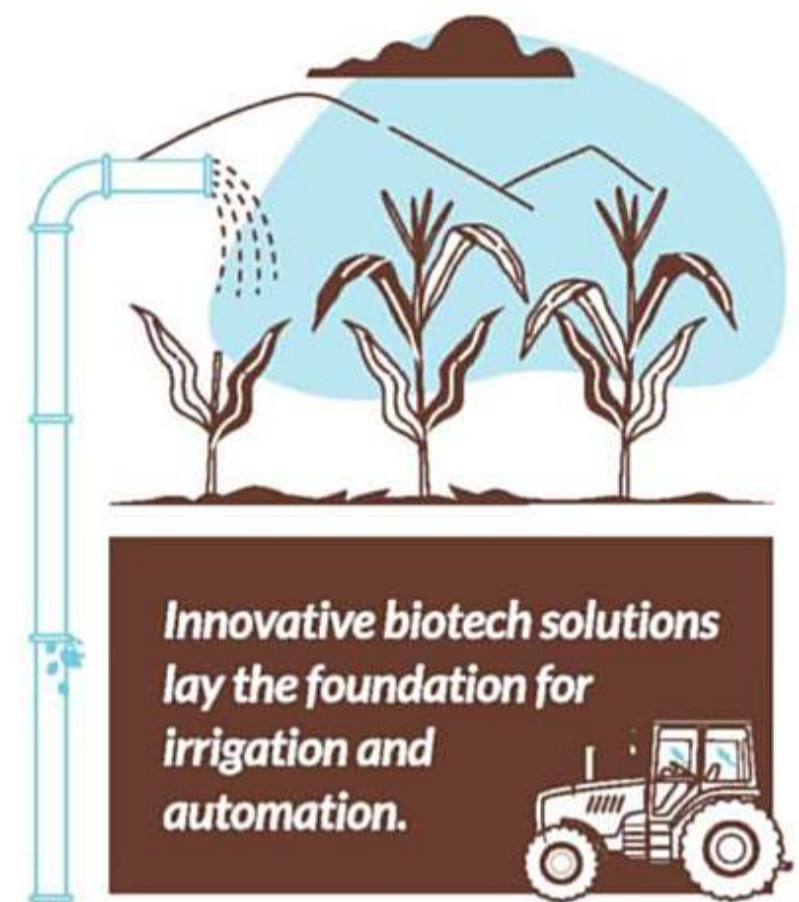
A solution therefore needs us to work with them to improve the soil they farm in, so that they can get better yield from crops, but use less water to do so. To address this need, innovative startups like EF Polymer and Virenxia are employing cutting-edge biotechnological strategies. They are among 16

competitors in the DCM Shriram AgWater Challenge, launched in June 2023. This challenge aims to discover and enable a range of approaches to address India's water crisis. It evaluates startups based on specific parameters including water use efficiency, scalability, affordability and profitability for small-holder farmers. These startups must demonstrate their solutions in a verifiable pool of 5,000 farmers or across 5,000 hectares of land by the end of the challenge.

EF Polymer, hailing from Rajasthan, developed Fasal Amrit through extensive research in India, Japan, and the U.S. This product represents a significant breakthrough in water conservation. Fasal Amrit is a super absorbent hydrogel, made with organic polymers from orange peels. It can absorb up to 100 times its weight in water and can be mixed up with soil and spread across the field. Just 5 kg of Fasal Amrit is enough for an acre of land and can be mixed with seeds and fertilisers, or just mixed with dry soil and distributed while ploughing. Once the field is watered, the polymer holds on to water and keeps the soil moist even after 15 days, and starts degrading into it after 180 days, becoming an organic fertiliser.

This affordable but effective solution is able to increase agricultural yield by up to 30% while reducing water requirement by 30-40%, and fertiliser requirement by 10-20%. The company has won numerous awards including from the Bill & Melinda Gates Foundation, and achieved a global presence in countries from Mexico to China and beyond.

Virenxia adopts a unique approach, not only enhancing soil's water capacity but also aiding farmers' transition to non-chemical farming. Despite initial challenges, this shift promises long-term



benefits in water efficiency and crop yields. However, small farmers struggle to make the transition, which leads to a temporary drop in yield as soil takes time to recover. The company's Anivara micronized soil rejuvenator solves the problem by fast-tracking the soil regeneration process and helping farmers match or improve yield right from the first year of switching from chemical to regenerative farming. With only one application needed per year for 3 years, it also reduces input costs and improves their earnings with better quality crops.

Virenxia has already demonstrated success in trials involving rice, wheat and cotton, and is currently in the middle of a trial for sugarcane, in partnership with Coca-Cola.

While many other problems need to be addressed to solve India's water crisis, these innovative biotech solutions are quite literally laying the foundation for further efforts, from irrigation to automation solutions, which will all benefit from soil that can better absorb and retain water.

Improving soil health also has various other benefits for the environment, and even for recharging groundwater, especially near the surface. As we continue to explore such innovative solutions, perhaps we can hope to one day, dig wells for water again, instead of going ever deeper and deeper with borewells.

The challenge aims to discover and enable a range of approaches to address India's water crisis.



MIND YOUR THOUGHTS

Technologies with potential to read one's thoughts have grown tremendously in recent years driven largely by artificial intelligence, a development that raises ethical and privacy issues

ROHINI KRISHNAMURTHY
NEW DELHI

IF YOU believe that no one can know what you are thinking, chances are you are not up-to-date with latest advancements in brain-computer interface (BCI). The innocuous-sounding technology has other-worldly effects.

This was on display in December 2023, when scientists from the University of Technology Sydney, Australia, released a video of a man reading lines silently in his head and a machine repeating his words. "Good afternoon! I hope you're doing well. I'll start with a cappuccino, please, with an extra shot of espresso," read the man from a screen, without uttering a sound. A robotic voice from a speaker announced: "Afternoon! You well? Cappuccino, Xtra shot. Espresso," states the university website.

As we think, or perform activities, such as picking up a cup of coffee and dancing, or even while resting, the activity of our nerve cells fluctuates. This can be picked up by neuroimaging devices such as EEG (measures electric activity by placing sensors on the scalp and was used in the University of Technology Sydney research); functional magnetic resonance imaging or fMRI (measures brain activity by detecting changes associated with blood flow); and magnetoencephalography or MEG (measures the magnetic fields produced by the brain's electrical currents).

These devices have been around for decades now, but use of artificial intelligence (AI) models, which can be trained to match a pattern of brain signals to thoughts or activities and to trans-

late them into sentences, has enhanced brain-reading technologies. A particular branch of AI called machine learning gives computers the ability to learn without being explicitly programmed to do so. Researchers first train the algorithm by feeding brain data corresponding to different phrases or words. Once it learns to see patterns of what words can be mapped to complex neural data, it can decode the inner language of the brain.

“A significant difference between our system and other commercial BCI will be the ability to decode more detailed thoughts from the human brain and the ability to output a natural language sentence,” C T Lin, lead investigator of the study and Distinguished Professor at the University of Technology Sydney, tells *Down To Earth* (DTE). The researchers say the accuracy of their technology is 40 per cent and they hope to increase it to 90 per cent, but they are yet to publish their findings in a peer-reviewed journal.

BCI enables users to send commands to computers through brain signals, without having to move their limbs, tongue, eyes or lips. The technology has use in diverse fields. In medicine, for instance, it could help people who have lost their ability to speak due to injury, stroke or paralysis, to communicate. By merely imagining moving a body part, a patient can steer a wheelchair or operate an artificial limb. BCI is also being explored in gaming applications to control gadgets through the brain.

The past couple of years have seen huge developments in BCI. Sample these. In May 2023, researchers from the University of Texas, US announced in a *Nature Neuroscience* paper that their AI



“After decoding some keywords from the EEG signals, we make use of large language models to rearrange and generate a natural language sentence”

CT Lin, Distinguished Professor, University of Technology Sydney, Australia



“We are seeing neurotechnology being more and more powered by AI. Machine learning has put this field on steroids”

Mariagrazia Squicciarini, Director for Social Policies AI and CEO of the Social and Human Sciences Sector, UNESCO

system, named semantic decoder, can capture the gist of an individual’s thoughts while listening to a story or imagining narrating a story (instead of performing a word-to-word decryption like the Sydney research). In August 2023, researchers from Meta AI and Paris-based École Normale Supérieure, PSL University reported that their AI model could recognise corresponding speech segments from brain recordings of 175 healthy participants listening to short stories. It showed an accuracy of up to 41 per cent. The findings are published in *Nature Machine Intelligence*.

All these examples, however, are of non-invasive BCI technologies. On January 30, 2024, Elon Musk, the founder of Neuralink, announced that the company had implanted a human with BCI powered by AI in a clinical trial. The individual is able to move cursor on a screen by just thinking, Musk announced on February 20 during an interview on social media platform X. The company has not revealed any information about the experiment to support its claim. Experts also say that surgical implants come with risks of infection.

BCI’s growing popularity is reflected in the number of research publications on the technology. A 2021 paper in *Frontiers in Systems Neuroscience* says that more than 2,000 studies on the technology were published in 2018-2020 compared to just 306 in 2003-2005. This progress in the past two decades raises concerns about the implications of the technology on the only frontier that has largely remained private: the human brain. “This is the one space that we need to be able to think private thoughts, have dreams and novel ideas, as well as figure out who we are,” Nita

A Farahany from Duke University, US, said in a podcast produced by UNESCO. There is a risk of corporations and governments gaining access to one's mind, she warns.

Government and private companies have thrown their hat into the ring. For instance, in 2019, the US Defense Advanced Research Projects Agency awarded funds to six organisations to develop BCI devices with national security applications such as controlling active cyber defence systems and swarms of unmanned aerial vehicles.

ETHICAL CONCERNS

As researchers try to perfect BCI, social scientists, ethicists and legal experts look at ethical and privacy challenges. A key issue is the ease of using non-invasive BCI devices. "This means a possible increase in widespread adoption of the technology, which could lead to challenges in ensuring that data collection and processing adhere to ethical standards," Ophelia Deroy, chair for Philosophy of Mind and Neuroscience, Ludwig Maximilian University of Munich, Germany, tells DTE.

A 2018 paper in the *Journal of Cognitive Enhancement* highlights how portable EEG devices focusing on brain health and wellness are mushrooming in consumer arena. Currently, such devices cost US \$99 to \$799 and can be purchased on company websites and retailers such as Amazon. A sensor worn on the user's head records and displays their brain activity on a computer. This can inform consumers of how their brain reacts to triggers. Once they recognise that, they can train themselves to alter their behaviour to reach a desired state.

Companies can use EEGs in the hiring process to choose the most qualified or suitable individuals.



"Governments are waking up to these concerns... the significance of mental privacy and its value in contemporary society must be explored"

Ophelia Deroy, Chair for Philosophy of Mind and Neuroscience, Ludwig Maximilian University of Munich, Germany



"Sydney researchers hope to increase the accuracy of their BCI to 90%... I think it could take time before we see something that can help people on the ground"

Surjo R Soekadar, Einstein Professor of Clinical Neurotechnology at the Charité-University Medicine Berlin, Germany

However, job seekers might not understand the implications of sharing their brain data or be aware of its potential misuse. For example, companies can look for a candidate's susceptibility to certain mental illnesses. This undermines the validity of informed consent, according to a 2023 UNESCO report "Unveiling the Neurotechnology Landscape Scientific Advancements Innovations and Major Trends".

There are fears that the technology could harm mental integrity, which is an individual's mastery of her mental states and brain data to ensure no one is entitled to read, spread, or alter data without their consent. "If these devices were to be hacked or manipulated to alter the individual's intended movements or follow the hacker's commands, this would not only impact the physical autonomy of the person but could also have important psychological effects such as anxiety, depression, or other mental health issues," the report reads.

A 2017 paper in *Nature* presented another scary, hypothetical scenario: Imagine a paralysed man participating in BCI clinical trials to move a robotic arm. Say, the man is frustrated with someone, and his thoughts are read by AI. Immediately, the robotic hand hurts the individual—an action the man is unlikely to have otherwise taken.

UNESCO plans to frame guardrails to help policymakers address such concerns. Countries like Chile, France and Spain are enacting laws to protect mental integrity or have neuro-data included in personal data protection laws. "Governments are waking up to these concerns. Questions such as the significance of mental privacy and its value in contemporary society must be explored," says Deroy. [DTE](#) [@down2earthindia](#)

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A delegate from Costa Rica celebrates a new initiative for jaguar in Latin America at the 14th Conference of the Parties to the UN Convention on Conservation of Migratory Species and Wild Animals

Stronger resolve

In the face of climate change, countries make a slew of commitments to ensure conservation of migratory species

HIMANSHU N DELHI



THE RECENT global conference on conserving migratory species had many firsts. The 14th Conference of the Parties (COP14) to the UN Convention on Conservation of Migratory Species and Wild Animals (CMS) was held in Samarkand, Uzbekistan, marking the first meeting for any UN environmental treaty in Central Asia. It also began on February 12 with the launch of the first-ever “State of the World’s Migratory Species”, which reveals how human-led dis-

ruptions threaten nearly half of the CMS-listed species. And, this meet saw more than 50 resolutions on migratory species, prompting CMS executive secretary Amy Fraenkel to assess it as the “best COP ever”.

One of the major outcomes of the meet, the “Samarkand Strategic Plan for Migratory Species 2024-2032”, details six goals on ensuring improved conservation status of migratory species; restoration and maintenance of their habitats and ranges; reduction in threats;

and measures for effective implementation of CMS. Parties also passed a resolution acknowledging the contribution of CMS to the Kunming-Montreal Global Biodiversity Framework under the UN Convention on Biological Diversity.

The theme for the meet was “Nature knows no borders”. A significant outcome, in this regard, was the adoption of the Initiative for the Central Asian Flyway, after nearly two decades of negotiations. Led by India, the initiative is sup-

PHOTOGRAPH COURTESY: IISD/ENB - KIARA WORTH

Route secured

Key outcomes at the 14th Conference of the Parties to the UN Convention on Conservation of Migratory Species and Wild Animals (CMS)

- 14 new species in need of international conservation added to CMS appendices
- One Health project launched for Central Asia to curb zoonotic diseases
- Samarkand Strategic Plan for Migratory Species for 2024-2032 released, detailing goals to safeguard their habitat and ranges
- Strengthened measures announced to address the illegal, unsustainable taking of migratory species
- Global guidelines issued on light pollution

FOR MIGRATORY AQUATIC SPECIES

- New mandate issued for addressing impacts of deep-seabed mineral exploitation on migratory species, prey and ecosystems
- Mandate strengthened on tackling bycatch and aquatic wild meat
- New action plans issued for Atlantic humpback dolphin, Hawksbill turtle and angelshark





ported by 30 countries covered under the flyway that spans a large area of Eurasia between the Arctic and Indian Oceans. The flyway has important migration routes of waterbirds, which are threatened by severe habitat loss, overexploitation and illegal killing, as per non-profit BirdLife International. “The Initiative for the Central Asian Flyway will act as a platform for capacity building, knowledge sharing, research and coordination among all range countries and will

pave the way to conserve the populations of the 600+ species of migratory birds that use this flyway,” Raghu Prasad, Inspector General of Forests, Union Ministry of Environment, Forest and Climate Change, said in a statement.

The “State of the World’s Migratory Species” report released at the meet highlights 399 species to consider for inclusion in the CMS appendices (see ‘Forced to vanish’, *Down To Earth*, 16-29 February, 2024). CMS Appendix I lists species protected from “taking” (intentional removal from the wild), while Appendix II species have an “unfavourable” conservation status and could benefit from effective management. At the meet, CMS parties agreed to include 14 migratory species—including the Eurasian lynx, Pallas’s cat, Lahille’s bottlenose dolphin, harbour porpoise and bearded vulture—in either or both of the appendices.

To address the destruction, degradation and fragmentation of habitats, CMS announced the Global Partnership on Ecological Connectivity (GPEC) to “protect and connect natural areas” of migratory species. The goal will be to ensure that ecological connectivity is maintained, enhanced and re-

stored in places of importance.

Further, to address concerns on the rise of zoonotic diseases, CMS under the leadership of the International Union for Conservation of Nature (IUCN) launched the One Health Central Asia project. Under this project, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan would implement actions to curb the emergence of zoonotic diseases.

CMS parties also discussed and adopted resolutions to address problems such as mitigation of light pollution and understanding the impacts of deep sea mining. They also strengthened measures for illegal and unsustainable killing of migratory species and extended ongoing concerted actions, such as those for giraffe and antipodean albatross. Action plans were introduced for Hawksbill turtle, angelshark and the Atlantic humpback dolphin as well as for the critically endangered dama gazelle and addax. The slew of resolutions made the meet a “milestone”, noted Fraenkel. “The ambitious goals set at COP14, coupled with the new Samarkand Strategic Plan for Migratory Species, offers us a clear roadmap for action,” she said. **DTE**

✉@down2earthindia

FOR MIGRATORY BIRDS

- Agreement on an Initiative for the Central Asian Flyway after nearly two decades of inconclusive negotiations, with setup of a coordinating unit in India
- New approach for global flyways coordination for CMS and non-CMS parties and partners
- Expansion and reinforcement of the prevention of illegal killing, taking and trade of migratory birds, with launch of a new Task Force in Southwest Asia



FOR MIGRATORY TERRESTRIAL SPECIES

- Numerous species-specific and range state-wide initiatives, such as a new transboundary jaguar initiative launched
- Establishment of a new initiative in northern Africa on the Sahelo-Saharan megafauna, with ambitious action plans for critically endangered species
- New programme announced to introduce the cheetah in Uzbekistan





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INTERNATIONAL WOMEN'S DAY SPECIAL

In India, women self-help groups have been a source of empowerment, fostering economic independence, social stature and community resilience. By pooling resources, providing microfinance opportunities and promoting entrepreneurship, these groups have significantly contributed to the reduction of poverty and demonstrated a successful model of grassroots development. *Down To Earth* delves into seven exemplary initiatives to illustrate the formidable influence of these village-level alliances

In a typical Indian village today, one is certain to find groups of women talking about finance. They can be seen sitting under a tree, in an abandoned school building, or in the front yard of a village resident's dilapidated home, holding thick notebooks. "I am a member of an SHG"—self-help group—most women residents of villages proudly introduce themselves. In a male-dominated society, where women play significant but never-recognised roles, this self-identification as members of SHG is a badge of honour and an assertion of a new identity of power.

India has some 0.65 million villages, as per Census 2011. In comparison, there are 9 million SHGs with nearly 100 million women members, shows Deendayal Antyodaya Yojna-National Rural Livelihoods Mission (DAY-NRLM) data, released in December 2023. This comes to, on average, 14 SHGs per village, with every eighth Indian woman being an SHG member.

An SHG is usually a community group of 10-12 women from similar socio-economic background. They form these alliances to pool their financial resources for taking up joint economic activities, or to lend money at a reasonable interest rate to members for starting small businesses. At the core of this group is the collectivisation of resources to enable financial stability and self-employment for women. A cursory evaluation of DAY-NRLM data shows that each SHG helps eight to 10 women start businesses.

The concept of SHGs started in the 1970s in a few rural pockets, the most notable among them being the formation of the Self-Employed Women's Association (SEWA) in Gujarat. In 1992, these groups were linked to banks for the disbursement of small loans—named SHG Bank Linkage Project or SHG-BLP—for setting up livelihood opportunities, like livestock rearing or a tailoring unit. While such groups continued to thrive, in 1999, the Union government decided to use them to promote self-employment in rural areas by introducing the flagship rural development programme—Swarn Jayanti Gram Swarajgar Yojana. This programme gave birth to thousands of such groups that received government patronage and support in running their operations.

In 2011, the government made SHGs the core implementers of its objective of ensuring livelihood opportunities for the country's poor under NRLM. With this, their status leapfrogged from that of a voluntary alliance to the executor of India's key development agenda. In 2014, the government created a special fund—Community Investment Fund—that provides SHGs with up to ₹50,000 a year to decide and design local livelihood programmes. This completed their transformation: from an informal alliance to a formal village group for undertaking development works to one that has a dedicated fund for implementing livelihood programmes.

Today, these groups are regarded as the world's largest microfinance project. As of February 2023, some 8.9 million SHGs have availed loans of ₹2.54 lakh crore, shows DAY-NRLM data. In 2023-24 (till February 2024), these groups dispersed loans amounting to ₹1.7 lakh crore. According to Economic Survey 2022-23, "The number of SHGs credit linked has grown at a CAGR [compound annual growth rate] of 10.8 per cent during the last ten years (FY13 to FY22), while credit disbursement per SHG has grown at a CAGR of 5.7 per cent during the same period."

It is often said that India's commercial banks have healthy balance sheets. This is mostly due to the massive waiving off of non-performing loans. But the loans under SHG-BLP rarely turn bad or require a waiver. "Notably, SHGs' bank re-

THE WAY GOVERNMENTS ARE PURSUING SELF-HELP GROUPS IN POLICIES AND PROGRAMMES IS QUITE AMAZING BECAUSE INDIA NEVER HAD SUCH AN ORGANISED ASSOCIATION OF WOMEN TO WORK AT THE VILLAGE LEVEL, TOUCHING NEARLY ALL HOUSEHOLDS. THIS MAKES DELIVERY OF DEVELOPMENT PROGRAMMES EASY

payment is more than 96 per cent, underscoring their credit discipline and reliability,” said the Economic Survey 2022-23.

The way governments are pursuing SHGs in their policies and programmes is quite amazing because India never had such an organised association of women to work at the village level, touching nearly all households. This makes the delivery of development programmes easy. More than this, SHGs have been roped in to implement schemes and programmes across the country, such as managing local community kitchens, running health services and overseeing slum redevelopment initiatives. According to government data, some 3 million women members of SHGs are currently managing 2.1 million agri-nutri gardens. A perusal of state policies shows that some 170 types of work have been assigned to these groups, while for many other activities—such as bank correspondents, local veterinary assistants and electricity connection supervisors—preference has been given to hiring SHG members. In 2022, Prime Minister Narendra Modi, while addressing a mega gathering of SHG members in Madhya Pradesh, said, “Over a period of time, ‘Self Help Groups’ turn into ‘Nation Help Groups.’” In the same meeting, he also promised that every rural household in the country would have one member in the local SHG.

SHGs have become a vehicle to seek votes from women, who are increasingly voting more than men in recent years. Political parties are releasing women manifestos, where SHGs emerge as the key points of delivering development. A review of state governments’ support to SHGs, specifically in 2018-2023, by *Down To Earth*, shows that 10 states—including Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Tamil Nadu, Kerala and Odisha—declared budgetary support to the tune of ₹5 lakh crore directly to SHGs. These are the states that have, or are setting up, separate departments to organise and direct development works to these groups.

SHGs have lived up to the expectations. There are outstanding examples of how women groups have managed and sustained development works that seemed impossible to deliver. These are not stories just to be celebrated on International Women’s Day; these are stories of India’s women who have successfully taken charge of the country’s development.

COVER STORY / WOMEN SELF-HELP GROUP

“WHY CAN’T WE HAVE OUR OWN BANK?”

The question that led to the setting up of India’s first women self-help group-led bank in the 1970s

KALEEM SIDDIQUI





PHOTOGRAPH COURTESY: SEWA

In 1972, the late Ela Bhatt, along with 12 self-employed women in the unorganised sector, set up the Self-Employed Women Association (SEWA) in Ahmedabad, Gujarat—considered to be the country’s first women self-help group (or a women’s trade union, as it was known at the time due to the lack of any precedent for it). A lawyer and trade unionist, Bhatt worked with women workers in the unorganised sector in Ahmedabad urban areas. She felt that the biggest challenge to empowering women was the lack of access to fair economic pursuits. “They must generate and control the capital,” she would later say as the guiding principle for setting up SEWA.

Immediately after the formation of SEWA, she had to face hurdles. Its members were termed “not bankable” by commercial banks, thus denying them the finance needed to start new businesses. On the other hand, the moneylenders were charging prohibitively high interest, which pushed the women into a debt trap. The challenges faced by women due to the absence of financial services would regularly come up during the meetings of SEWA. In one such meeting, some women frustratingly asked, “Why can we not have our own bank?”

In 1974, SEWA registered the Mahila Sewa Co-Operative Bank, or SEWA Bank. It was the country’s first such cooperative of self-employed women. Its 4,000 members—all unorganised women workers—contributed ₹10 each as their founding capital. Its owners and customers belonged to the same socio-economic groups and stayed together in the same neighbourhood. The cooperative bank’s services range from opening savings accounts, recurring accounts, giving loans for businesses, owning or repairing houses, depositing money for fixed tenure, and a pension scheme as well. Today, SEWA Bank is popularly known as the “rich bank of the poor”. In 2016–17, it had over 471,000 depositors with a working capital of ₹345 crore. The SEWA Bank also started SEWA’s famed cooperatives, which are not just focused on services but also on various trades.

In 1980, SEWA made inroads into rural areas. This was the time when the country was witnessing the dairy revolution sweeping Gujarat. SEWA did something that was unheard of: setting up the country’s first dairy cooperative led by women called Dholera Women Milk Producers Cooperative Society. “Women look after cattle, give fodder to them and milk them, and that is why only women should control the dairy cooperatives,” Ela told *Down To Earth* (DTE) in a conversation in 2012. With 50 members, the dairy cooperative prospered and inspired women from nearby villages to form such groups. In 1980–84, SEWA registered 15 women-led dairy cooperatives. SEWA currently has 4,000 SHGs, 110 cooperative societies, 15 federations of cooperatives, and three companies, all led by women. Smita Bhatnagar, a senior coordinator with SEWA, told DTE, “The women self-help movement that started over 50 years ago now has a footprint in 18 states.”

These networks have 2.1 million women members are into 125 trades ranging from healthcare, banking, insurance, child care, housing, legal services, videography, research, training and capacity-building. The group has also established Rudy Multi Trading Company for the purchase and sale of agricultural products, and its annual turnover is approximately ₹25 crore.

Jyoti Ben Maikwan, general secretary of SEWA, says, “When the women’s groups in rural areas started to stand on their own two feet, we introduced the concept of Bachat Mandali (savings group), where 20-25 women were asked to save collectively to ensure their overall financial well being. The money saved by these *mandalis* is deposited in the SEWA bank, which gives them dividends every year.”

◀SEWA currently has 4,000 self-help groups, 110 cooperative societies and three companies, all run by women

LOOMS OF LIFE

Changpa women engender an economic turnaround by taking over the trade chain of the world's most expensive fibre

BHAGIRATH

Located 4,900 metres above sea level on the Indo-China border, Chumur village's remoteness dictates the way people craft their lives and livelihoods. Here, in the heart of Ladakh's Changthang region, the Changpa people, pastoralist nomads, navigate their existence around their prized assets: goats, yaks and sheep. The harsh climate—over six months of extreme cold and a short-lived summer—sets the way for them to manage their economy. While men tend to the rearing and shearing of livestock during the brief summer, women spend the long winter months weaving and knitting wool into various garments and goods, either for personal use or for the local market. Not known to many, Chumur and other villages in the high-altitude pasturelands of Changthang are hubs of a lucrative fibre trade.

At the core of this trade lies the indigenous Changra goat, used for producing one of the world's most sought-after natural wool—pashmina or cashmere. It is said that to own this precious fibre, Dogra kings annexed this region to their kingdom in the 19th century. India produces less than 1 per cent of the global value of 10,000-15,000 tonnes of pashmina per year, but it is considered the finest in quality. Changpa women, thus, are at the centre of this trade. The famed pashmina shawl fetches up to ₹50,000 apiece in upmarket showrooms in Delhi or Mumbai. Yet the local rearers earn meagre wages because they only collect and send the raw wool to processors in Jammu and Kashmir, Punjab and Himachal Pradesh. "Earlier, I would earn just ₹1,000 during the tourist season because our community did not know the true value of the product or had the know-how to market it," says Shakeela Bano, a 47-year-old resident of Leh.

This changed in 2015 with the start of a self-help campaign for women. The transformation started during a visit to Chumur by Prasanna Ramaswamy, the deputy collector of Leh at the time. He was struck by the low price of locally crafted goods. In response, he initiated the Laksal skill-development programme to enhance the craftsmanship of women across eight villages in the Changthang Valley. Inspired by the cooperative self-help model of Amul, these women embarked on a journey to organise themselves and establish a reputed brand.

The first step was to train women working in Leh's traditional women groups, known as Ama Tsogspa, that already had small production units and access to local markets. In May 2017, these informal alliances from eight villages organised themselves into self-help groups and launched the Looms of Ladakh collective.

Headed by the deputy commissioner of Leh, the collective has a board of directors represented by two women from every village. Embracing a "farm to

Looms of Ladakh in Leh has 427 women members from various self-help groups across 16 villages and consumes 52 kg of pashmina wool every month ▶

PHOTOGRAPH COURTESY: LOOMS OF LADAKH





POWER PLAY

The experience and support of the local women self-help group helped Aarti Devi Kol win the panchayat election in her maiden attempt

AARTI DEVI Kol's journey from a high school graduate to the sarpanch of Bousad panchayat in Madhya Pradesh is a testament to the transformative power of women self-help groups (SHGs). Joining her local SHG in 2020 with little awareness of her region's social challenges, Kol initially remained a silent participant. However, as she became aware of issues like sanitation, nutrition and livelihood, she became an active advocate for change. Her initiatives included campaigning for the establishment of an anganwadi centre, organising vaccination drives, and launching ambulance services. Kol's most significant achievement was promoting kitchen gardens, highlighting their nutritional and economic benefits, and arranging training sessions for women.

By 2022, Kol's dedication to community improvement had made her a prominent figure, leading the women of the SHG to support her candidature in the panchayat elections. Running against seven opponents, she won by a significant margin of 160 votes, a victory she attributes to the backing of her SHG. As sarpanch, Kol has continued her efforts, focusing on the effective execution of the Mahatma Gandhi National Rural Employment Guarantee Scheme and mid-day meal programme, thus furthering her commitment to enhancing women's social independence in her village.

(Based on a conversation with Anil Ashwani Sharma)

fashion" approach wherein primary producers oversee procurement, processing, and sales, the federation rapidly gained momentum.

Today, boasting 427 women members from various self-help groups (SHGs) across 16 villages, Looms of Ladakh has witnessed exponential growth. In the financial year 2022-2023, the federation recorded sales worth ₹34 lakh, a figure that surged to ₹39 lakh in the first 10 months of 2023-24. Monthly pashmina consumption skyrocketed from 7 kg in 2021 to 52 kg in 2022, signalling robust business turnover. Moreover, local wool consumption tripled during the same period.

One-third of the revenue generated is distributed among the women members; 40 per cent is spent on procuring raw wool, which again is done by the women; and the rest is to manage the enterprise. Members involved with spinning and knitting now earn ₹3,000 a month, while those in weaving, natural dyeing and tailoring earn up to ₹18,000 a month.

The group sells its products in the domestic market, mainly in local stores in Leh, in exhibitions across the country and at the hotels of the Taj group. The group is trying to include SHGs in 10 villages in Kargil and Leh districts and is also training 150 women at their office in Leh.

All the office bearers are elected by the members every three years. This makes the SHG federation a democratic institution. Bano was elected as the chief executive officer in 2023. Before this, she was elected as the cashier, artisan leader and tailoring master for three years.

"Our enterprise has trickled down to even the remotest villages and households. We give raw materials to the women belonging to the SHG living in remote villages. By selling those products, we also transfer fair earnings to them," says Bano, a mother of three children who used to run her family with her husband's pension earlier.



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CATERING DREAMS

From an initiative to empower women, Kerala's Kudumbashree Mission has become the lifeline of the state

K A SHAJI

When the Kudumbashree Mission was launched in 1999, it was a government-sponsored endeavour aimed at empowering women, primarily through credit activities in Kerala's rural areas. However, what began as a modest initiative has transformed into a project that is fuelling community development.

Supported by the Union government and NABARD (National Bank for Agriculture and Rural Development), India's apex development bank, Kudumbashree has metamorphosed into the world's largest collective of its kind, boasting over 309,000 self-help groups (SHGs) spread across the state.

Throughout its journey, Kudumbashree has proven its resilience, particularly during times of crisis. From the devastating Kerala floods of 2018 to the unprecedented challenges posed by the COVID-19 pandemic, women affiliated with the mission have emerged as pillars of support for their communities. During the pandemic, Kudumbashree facilitated interest-free credit amounting to some ₹1,917 crore to 2.5 million members, providing a lifeline to Kerala's economy.

The Adheba self-help group provides direct employment to 200 women and maintains a vast network of 3,500 chefs and caterers across Kerala





A BUYOUT

By creating a self-help group, Meena Rahangdale raised money to buy the rice mill she used to work in as a daily wage labourer

WHEN THE rice mill where Meena Rahangdale worked as a daily wage labourer shut shop during the COVID-19 pandemic, she did not lose heart. "The income had stopped and the mill owners wanted to sell the machines. Fourteen of us decided to buy them," she says. Rahangdale, who is a graduate, and the other women daily wage labourers formed a self-help group. "We pooled in ₹40,000 per head from our savings to collect ₹5.6 lakh and took a bank loan of ₹2 lakh under the government's Deendayal Antyodaya Yojna-National Rural Livelihoods Mission," she says.

Since the group had no common space, they decided to set up the machine at the cattle shed in Rahangdale's house. "This also ensured that we do not have to commute to the mill, which is some 12 km from the village," says Rahangdale. "So far, we have made a profit of about ₹3 lakh which we plan to use to repay the loan and expand the business," says Rahangdale.

Riding on her success, Rahangdale contested the 2023 Madhya Pradesh Legislative Assembly elections as an independent candidate but lost. "Many political parties approached me after that, but I have joined the Bharatiya Janata Party and am working as its zonal head," says Rahangdale.

(Based on a conversation with Anil Ashwani Sharma)

Furthermore, Kudumbashree's impact extends beyond financial support. The organisation's proactive engagement in various sectors, including catering, organic farming, agri-business and food processing, has empowered women to explore innovative avenues and contribute meaningfully to the economy.

One of the oldest ventures under Kudumbashree, started 10 years after the launch of the scheme, is the Adheba Institute of Food Research and Hospitality Management, situated in Thrissur. Adheba has become a symbol of empowerment, training women from low-income backgrounds in culinary arts and hospitality management.

Rathi Kunhikrishnan, who conceived and proposed the idea of Adheba to Kudumbashree, told *Down To Earth* (DTE), "Rural women usually cook well and they are ready to experiment. So I thought food was an area in which rural women could attain self-dignity." Till now, Adheba has trained over 35,000 women to become chefs, with 15,000 of them undergoing advanced training to establish local catering units.

Today, Adheba provides direct employment to 200 women and maintains a vast network of 3,500 chefs and caterers across Kerala. Moreover, the institute's influence extends beyond state borders, with training programmes being extended to women SHGs in Andhra Pradesh and Jharkhand.

"If you have to celebrate an event in any corner of Kerala's 14 districts, you can call us and avail our service," says Rathi. The initiative, operating on a non-profit model, ensures that profits are equitably distributed among involved families, fostering a sense of collective ownership and empowerment.

As the Kudumbashree Mission commemorates 25 years of transformative impact, it has prompted many disempowered women to venture into innovative areas like organic farming, farm tourism, agri-business, meat processing, poultry, food processing, aquaculture and other micro-enterprises. It is also running an e-commerce platform for marketing products made by members.



FLIGHT OF HOPE

Women pilot AIIMS Rishikesh's initiative to use drones to carry medical supplies to remote health centres

VARSHA SINGH

Mamta Raturi at AIIMS Rishikesh prepares for the take off of a drone carrying medical supplies to a remote health centre in Uttarakhand on February 2

On February 1, the All India Institute of Medical Sciences (AIIMS), Rishikesh, became the first government hospital in the country to employ drones to carry medicines to remote community health centres. Steering the maiden drone flight was Mamta Raturi, an arts graduate from Rishikesh who, until recently, was engaged in community development initiatives like enrolling fellow women in government schemes. The drone ferried tuberculosis drugs to the community health centre in the hilly district of Chamba.

“In half an hour, the drone covered a distance that would have taken 3-4 hours by road,” says Raturi. She stands alongside Pushpa Chauhan, a homemaker from Chamba, as one of the two licensed drone operators in Uttarakhand right now entrusted with the critical task of delivering life-saving drugs to remote government health centres. Their journey began with intensive training in Manesar, Haryana, where they acquired the necessary skills to navigate drones, chart flight plans, and troubleshoot technical issues.

“I learned about the initiative in February 2023, during AIIMS Rishikesh's trials



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RURAL DRIVE

Rooted in principles of group solidarity and microfinance, women self-help groups have been pivotal in transforming rural economies

SELF-HELP groups (SHGs) have become a cornerstone of women's empowerment in India, with 88 per cent of the country's 120 million SHGs being women-led. Rooted in the principles of group solidarity and microfinance, SHGs have been pivotal in transforming rural economies and uplifting rural women.

Initiatives like the Haksurian economy in the 1960s and recommendations by the Sivaraman Committee in the 1980s laid the groundwork for this transformation. Muhammad Yunus's Nobel Prize-winning microfinance model from Bangladesh has been influential in shaping SHG practices in India. The National Rural Livelihood Mission has further bolstered SHGs, enhancing self-esteem, reducing social evils and fostering community participation. During the COVID-19 pandemic, SHGs played a vital role in crisis management, producing essential goods, delivering services, and supporting livelihoods.

With their grassroots presence, trust and local knowledge, SHGs are well-positioned to drive rural development. Key factors for women's empowerment include skill development, financial inclusion, farming collectives, health and social inclusivity. As women gain economic freedom through SHGs, they also gain political influence, shaping the landscape of Indian democracy.

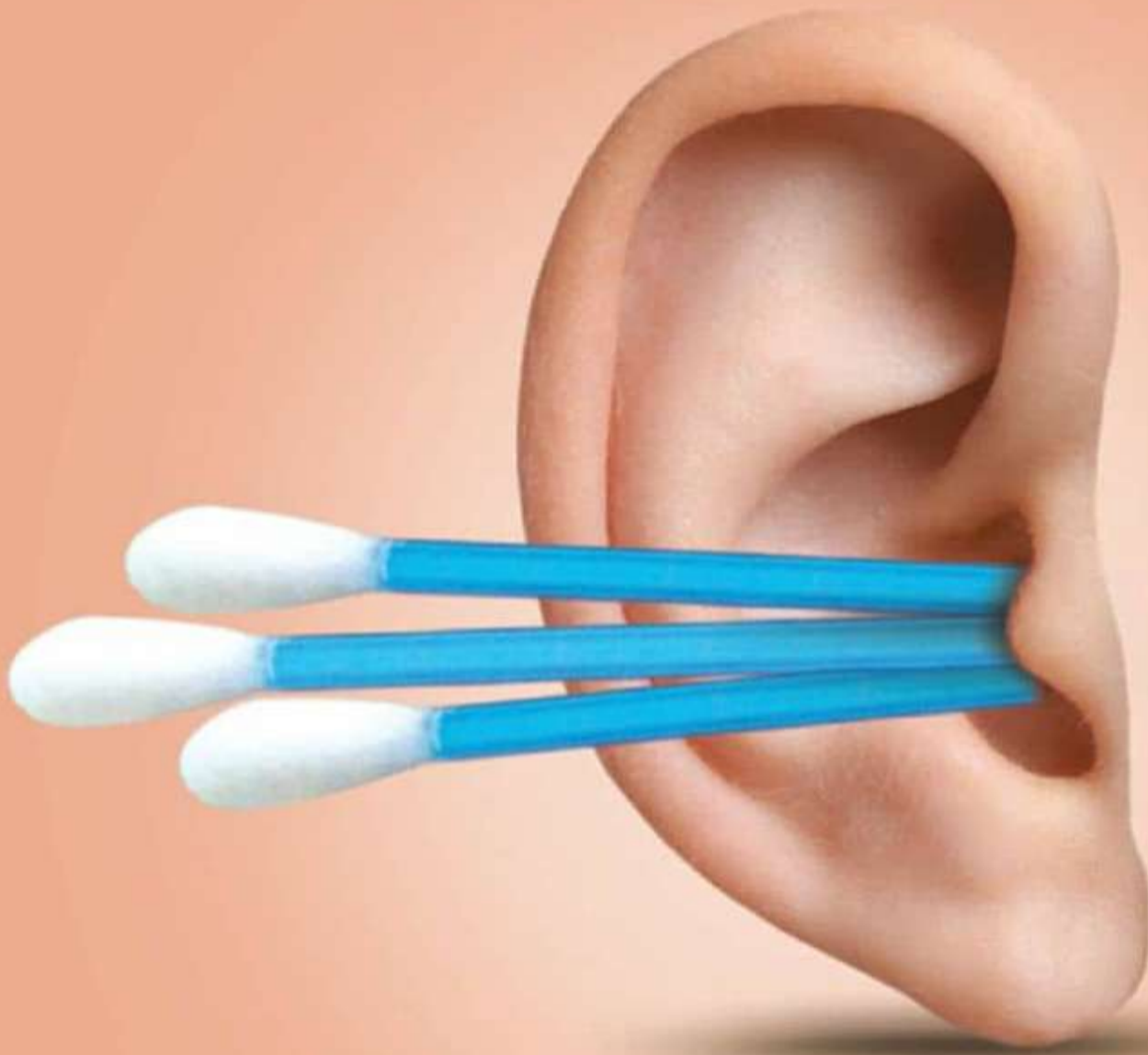
— By Harsh Mani Singh, assistant professor of economics at Iswar Saran Degree College, University of Allahabad

and immediately enrolled. In January this year, I attended training at the Drone Destination institute in Manesar, Haryana, and earned my licence," says Raturi.

Meenu Singh, director of AIIMS Rishikesh told *Down To Earth* that the hospital is currently using two medium-sized drones that can carry loads of up to 6 kg and fly up to 50 km on a single charge. "The initiative not only marks a significant technological advancement but also underscores the indispensable role of women in driving progress and fostering resilience in communities. The idea is to create a network of women with self-help groups (SHGs) in hilly areas of the state who are adept at flying these drones," she says. The drones are currently being used to supply medicines and vaccines to the hilly areas and on their return journey carry patient samples for testing at AIIMS Rishikesh. As the network expands, drones will facilitate emergency deliveries, ensuring timely access to critical supplies like platelets and medications for patients across the state.

"Drone *didis* will substantially improve the quality of services provided at health centres across the state. We have so far delivered medicines to three health centres in Chamba, Hindolakhil and New Tehri districts. The current range of the drones means they can only be used in the seven districts in the Garhwal region," she says. The drones are currently being managed from Rishikesh, and women are being trained at the community health centres to load and unload the medicines, check the batteries and, most importantly, place the drones in the right direction to fly back to Rishikesh. "Right now, members from the drone company are present at the community centres to assist with the process. They will leave once the training of the women at the centres is completed," says Raturi.

Building upon the initial success, plans are underway to establish a drone delivery centre at AIIMS Rishikesh's upcoming satellite facility in Udham Singh Nagar to cater to the six districts in the state's Kumaon region. News reports suggest that nine more AIIMS are preparing to launch similar drone delivery services, highlighting the pivotal role of drone *didis* in propelling this movement.



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DEDICATED JOB

Women self-help groups in Odisha have become implementing partners for crucial government services

SHAGUN

A remarkable transformation is underway in Odisha, where a dedicated workforce of women from self-help groups (SHGs) is leading crucial government initiatives. These SHG members are actively involved in a variety of roles, including monitoring water meters, providing sanitation services, managing patient diets and preserving urban spaces.

The evolution of SHG members into implementing partners marks a notable advancement since the inception of the Mission Shakti programme in 2001, which initially focused on promoting women's empowerment through SHGs. From traditional activities such as broom making and tailoring, women's involvement in government projects has grown, instilling newfound confidence and positioning them as indispensable contributors to the state's progress.

One of its achievements is the revitalisation of Bhubaneswar's Nicco Park, which was damaged during cyclone Fani in April 2019. After failed attempts to rebuild the park with the help of private contractors, the Bhubaneswar Development Authority gave contracts to 22 SHGs for different tasks under the park's redevelopment plan. *Down To Earth* spoke with members of the Baba Gorakhanath SHG responsible for dewatering, deweeding, biomining and dismantling stone masonry from the three sedimentation tanks in the park.

Transitioning from operating a tiffin service, the women of the Baba Gorakhanath self-help group have rejuvenated Bhubaneswar's Nicco Park, which was destroyed after cyclone Fani in 2019



“We started the SHG in 2017 to run a tiffin service from our homes, so this was a huge transition for us. We underwent training by the Bhubaneswar Municipal Corporation to understand how to hire and supervise labour and procure equipment and started the project in 2021 after taking a loan of ₹5 lakh,” says Manisha Ranasingh, one of the 12 members of the SHG. The labour for the project was sourced from the state’s Mukhya Mantri Karma Tatpara Abhiyan, an urban wage employment initiative launched in April 2020 due to the COVID-19 pandemic.

Today, even though the overall redevelopment work is still underway, the park wears a different look. The ponds have been desilted, biomining has been completed on most of the area, and there is no foul smell or waste in the park. “We completed the job late last year. We are very proud of the work we have done, and we are hoping to bag the government contract to maintain the park,” says Ranasingh.

Sarada Prasad Panda, project director, and secretary of Odisha Urban Development Agency, says that success rates are higher when women SHGs from local communities are made to handle projects because they have a vested interest in local development.

A similar success story can be seen in Puri, where the *jal sathi* initiative has emerged as an example of community engagement in water management. Selected from SHGs, these women serve as frontline ambassadors, facilitating water distribution, collecting bills and addressing citizen concerns. The initiative was started in 2019 by the Water Corporation of Odisha (WATCO) under the state’s housing and urban development department to engage women SHGs to provide consumer-friendly services on people’s doorsteps. “SHG members are the representatives of the communities they live in, and roping them in was essential for effective service delivery,” says Bhabani Shankar Mohanty, general manager, Puri division, WATCO.

The *jal sathis* are paid a commission: 5 per cent of the collected water fee and 2 per cent of the taxes. They also receive ₹100 on every new connection and ₹20 for every water testing completed at household levels. “The consumers trust the *jal sathis* and give honest feedback on the services. The bill payment regularity and frequency have also improved. They also help in developing water-judicious behaviour and creating a sense of ownership among consumers,” says Mohanty.

In Bissamcuttack, tribal women from 11 SHGs have joined forces to supply nutritious meals to the local community health centre. They ensure the timely provision of meals while also operating a community cafe. “The hospital has given us a diet chart, according to which we prepare the food,” says Singari Wanaka, president of the Adivasi Vikash Mahila Sangh SHG.

While the women earned the contract for cooking food for the hospital patients in mid-2022, they opened the cafe in June 2023. Of the 11 women with the SHG, four work as cooks, three as waiters, two as cleaners, and two supervise and run the place. “The food is good, hygienic and supplied on time. Before this, a private vendor was the supplier and food was supplied only twice a day,” says Jayanti Behera, a nursing officer at the hospital.

The women are now in the process of setting up a millet cafe, under the Odisha government’s Millets Mission. The construction work is underway on the top floor of the building. To promote millet consumption in the state, Mission Shakti and the Odisha Millets Mission have tied up to open millet cafes across the state. These cafes are managed by SHGs and sell an array of millet-based food products.

By leveraging the collective strength of SHGs, Odisha has unlocked a potent force for grassroots development, setting a precedent for inclusive governance and community-led progress.

LAKHPATIS ALL

In her budget speech this year, Union Minister of Finance Nirmala Sitharaman announced a target to have 30 million Lakhpati Didis—women who have received help under the Deendayal Antyodaya Yojna-National Rural Livelihoods Mission—increase their annual income to at least ₹1 lakh. The idea took birth in 2021, when the Union Ministry of Rural Development announced an initiative for “creating Lakhpati SHG women” by providing assistance to self-help groups in villages. Prime Minister Narendra Modi, in his Independence Day speech last year, set the target at 20 million women. So far, India has about 10 million Lakhpati Didis, as per Union Ministry of Rural Development data. SANDEEP KUMAR MEEL from Rajasthan, VARSHA SINGH from Uttarakhand, RAKESH KUMAR MALVIYA from Madhya Pradesh and RAJU SAJWAN from Jharkhand report on women who have overcome significant odds to become *lakhpatis*.



SHOP OWNER

KAMLA KHARADI
Ora Bara village,
Dungarpur, Rajasthan

Kamla Kharadi and her husband were farmers and daily wage labourers who always struggled to make a living. In 2011, she joined a self-help group, Jai Baba Ramdev, and took multiple loans to build her life. She started by taking a loan of ₹2,000 to meet her daily household expenses. She then took loans of ₹5,000 to get a power connection, of ₹30,000 to build a house, of ₹50,000 to open a grocery shop and another one of ₹50,000 to help her husband buy a vehicle to sell vegetables. “I take a loan only after I have cleared the last one. I now earn ₹20,000 a month from the grocery shop,” she says.



FPO FOUNDER

PAVITRA RANA
Gangori village,
Uttarkashi, Uttarakhand

Sixteen years ago, Pavitra Rana, now 37 years old, worked in her fields to grow and sell vegetables. But the profits were very low. In 2008, she joined a self-help group named Ganga Maiya, which increased her profits because the group dealt in large volumes, without intermediaries. In 2022, Rana, with some 200 women, formed a farmer producer organisation (FPO), Bhagirathi Annapoorna, to collect and sell crops grown by its members. “In 2023, we sold 30 tonnes of Mandua, a millet, to the agriculture department. My annual income is ₹1-1.75 lakh,” says Rana.



GRAIN TRADER

SANTOSHI MARKAM
Bondar village, Dindori,
Madhya Pradesh

When Santoshi Markam joined the Durga self-help group in 2020, she had no income of her own. Along with other family members, she worked in the fields. “I wanted to do something on my own,” says Markam, a matriculate. About a year after joining the group, she took a loan of ₹50,000 which she used to start a small seed shop selling pulses. “My husband supported me and our profits made me expand the scope of our operations. I took another loan of ₹1.5 lakh and started trading grains. I now earn about ₹1.5 lakh a year,” she says.



HORTICULTURALIST

PREETI DEVI
Partoli village, Khunti,
Jharkhand

“Our family owns about 0.8 hectare which is enough to grow grains for our consumption. But we were always short of money to buy other items,” says Preeti Devi. “Someone suggested us to grow and sell *genda* (marigold), but we did not have money to start its cultivation,” she says. In 2019, Devi joined Vikas Ganapati Mahila Mandal, a self-help group, and took a loan of ₹30,000. “We grew *genda* in half the field and sold it for ₹90,000. My annual income is now over ₹1 lakh,” she says. “I am in a position to repay the loan and my husband now operates an autorickshaw,” Devi adds.

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FOOD FOR ALL

One of the major reasons behind the success of Tamil Nadu's Amma Canteen scheme is the decision to employ women self-help groups

RITESH RANJAN

When the Amma Canteen scheme was launched in February 2013 by the then chief minister of Tamil Nadu J Jayalalitha, many believed it was yet another voter-appeasement stunt that would fizzle away over time. The idea was simple: provide affordable meals to the people through a network of canteens, owned by the state government but run by women self-help groups. In 2021, when the Dravida Munnetra Kazhagam, a rival party, was voted to power, the new government announced the setting up of another 200 canteens in semi-urban areas over time.

Today, about 407 canteens are functioning in the state. The popularity of the scheme can be assessed by the fact that these canteens daily prepare about 4.5 million idlis and 1.2 million plates of pongal for breakfast, and 2.5 million plates of sambar rice and 1.1 million plates of curd rice for lunch.

It has attracted the attention of other states as well. In Rajasthan it is the Annapurna Rasoi Yojana, where breakfast is served for ₹5 and lunch for ₹8. In Madhya Pradesh, it is called the Deendayal Canteen; in Andhra Pradesh, the NTR Anna Canteens and in Delhi, the Aam Aadmi canteens. The Amma Canteen scheme directly attacked urban hunger and malnutrition, as food is served at a highly subsidised price. Further, food is prepared and served in a hygienic environment.

One of the major reasons behind the scheme's success is the decision to employ women self-help groups. The Amma Canteen follows an inclusive approach to employment, prioritising widows, poor and vulnerable women for recruitment. With over 4,500 women currently employed across the state, the scheme has emerged as a vital source of livelihood for marginalised communities. Moreover, its focus on self-help groups ensures that women from disadvantaged backgrounds are given the opportunity to rebuild their lives with dignity and independence. Each canteen employs 12-16 women, each of whom gets a monthly salary of ₹7,500. The payment is made through cheques to the self-help groups that distribute the same to their members.

“When my husband died in 2012, he left nothing for us. We were living hand-to-mouth until 2013, when I got a job at an Amma Canteen. Today, my daughter has finished college and will start working soon, and my son has just started college. There are many women like me who are leading a dignified life because of the scheme,” says Vijayalakshmi, who earns ₹9,000 a month.

As the scheme continues to serve millions of people across Tamil Nadu, its legacy as a symbol of inclusivity endures. For the women employed in the canteens, it represents not only a source of sustenance but also a ray of hope for a brighter tomorrow.

With over 4,500 women employed across the state, the Amma Canteen scheme has emerged as a vital source of livelihood for marginalised communities ►





CLEAN SWEEP

Over 18,000 Karnataka women have transformed the idea of cleanliness into a sustainable business model

M RAGHURAM

Plastics are rapidly vanishing from rural and semi-urban Karnataka, thanks to the efforts of an army of 18,000 women who have worked tirelessly to sensitise the people and remove the non-biodegradable waste from their locality. This crusade to tackle solid waste, which includes plastic, has also ensured economic independence for these women who are part of over 2,000 self-help groups (SHGs) in the state operating in smaller towns and villages.

“People have stopped accepting plastic from shopkeepers. It is only being used in the fish and meat markets because there are no alternatives. But people even reuse these plastic bags several times,” says Priya Salian, a member of the SHG from Laila in Belthangady taluk in Dakshina Kannada district.

Designed to cover all 30 districts of Karnataka, the initiative was started in 2021 under the National Rural Livelihoods Mission to provide solid waste management training for women from low-income families. The training is spearheaded by the state’s Mahatma Gandhi Institute of Rural Energy and Development

Over 18,000 women from 2,000 self-help groups are responsible for solid waste management in the smaller towns and villages of Karnataka



BESIDES TRAINING, THE KARNATAKA GOVERNMENT SUPPORTS SELF-HELP GROUPS IN FORGING PARTNERSHIPS WITH LOCAL AUTHORITIES TO ENGAGE IN WASTE MANAGEMENT INITIATIVES

with support from key state government departments, including rural development and panchayat raj, and rural drinking water and sanitation.

“The ecosystem was created to transform the idea of cleanliness into a sustainable business model by providing alternate livelihood opportunities to women,” says Parameswar Hegde, director, implementation support activities, rural development and panchayat raj department, Karnataka.

Besides the training, the state government also facilitates SHGs in drawing Memorandums of Understanding with gram panchayats and town administration to integrate the women into waste management processes. The beauty of the initiative is that the SHGs have the flexibility of altering their solid waste management plan, taking into account local challenges.

“In the initial days, households would mix their wet and dry waste and throw it outside their house in polythene bags. The plastic bags had a strong stench and segregating them was a nightmare. So, we carried out a drive where we visited all the houses to sensitise the families on the importance of waste segregation and the need to avoid plastic. Today, source segregation is done in more than 60 per cent of the houses in our village,” says Hameeda Begum, a Swachha Karmika from Kotepura village in Karnataka’s Dakshina Kannada district.

In the temple town of Halebeedu in the state’s Hassan district, the 10-women-strong Yashaswini Swasahaya Gumpu SHG focusses on collecting plastic waste from market places and temple complexes and selling it to a waste recycling centre outside the town. “We make at least ₹25,000 per month, which we distribute among ourselves. Some of us have further created smaller groups in the market and tourist areas,” says Anita. The SHG in Vamanjoor village in Dakshina Kannada district has set up a vermicompost production unit that supplies nurseries and garden shops. “Our product is now used by high-value button mushroom production units that bring good returns. We are not able to meet the demand and are looking at ramping up our production,” says Leela Kundar, leader of the SHG.

The Navodaya Multipurpose Souharda Cooperative Society Limited has the highest 20,532 SHGs across five districts because the cooperative facilitates easy access to credit for low-income women, fostering empowerment and economic stability. “Empowering women has far-reaching implications, from enhancing children’s education levels to improving household economic security and hygiene standards,” says MN Rajendra Kumar, former president of the Karnataka State Co-operative Apex Bank, which provides easy credit to SHGs in the state.

With over 600 batches of 30 women trained so far, the impact of this initiative extends far beyond its initial investment, underscoring its pivotal role in reshaping Karnataka’s socio-economic landscape. Every rupee invested in this transformative endeavour has yielded dividends, paving the way for a brighter and more sustainable future. [DTE](#) [@down2earthindia](#)

Follow the Chinese way on high tech

Making universities the hub of innovation and churning out scientists adept in frontier technology has put China at the top

O PINION ON China is generally hostile in this country. War in the 1960s all but obliterated a unique friendship and a shared vision for peaceful co-existence that was enunciated in the Panchsheel Agreement between India and China in 1954. So inspiring was the set of principles announced by prime ministers Jawaharlal Nehru and Zhou Enlai that it was incorporated in the Bandung Conference declaration a year later by 29 Afro-Asian countries for a new era of peace and development. Rajiv Gandhi's epochal visit to Beijing in 1988 managed break down the great wall of animosity between the two countries, but relations have become a lot worse in recent years.

When it comes to the economy and China's technological prowess, the Indian government and its handmaiden media, in particular, tend to be dismissive and disparaging, fuelled by barely disguised resentment and envy. This results in paradoxes. In recent years, when the Narendra Modi government banned around 250 Chinese apps citing these to be "prejudicial to the sovereignty and integrity of India, defence of India, security of the state and public order", there was a frenzy of nationalist outpouring on WhatsApp exhorting patriotic Indians to boycott the apps. The irony is that the messages were, for the most part, being sent on Chinese-made mobile phones which they were unwilling to jettison!

While the world is overawed by China's cutting-edge scientific and technological breakthroughs, albeit with some trepidation, Indians tend to act like ostriches. Nothing is reported. Nothing is acknowledged. Instead, we have commentators writing that India should take care to avoid the patent follies of China, where apparently quantity was the criterion and not quality. One of the most absurd and peevish observations I came across in a business paper was that China's policy had spawned a frenzy of patent-filing of very little value—"junk patents with scant innovation". Was the writer taking his cue from the official line on China? Possibly since an official in the top economic advisory body was also cautioning India not to follow the Chinese model based on utility patents.

Let's understand why patents are granted in the first place. Broadly, these are granted for innovative ideas that have utility value. For some years now China has emerged as the top patent filer worldwide, a development that has caught the interest of the world. While there may be dross in the pile of gold—it's easy to find silly patents everywhere—China's patents have been



spectacular in several fields such as communications technology. In early February, China Mobile, the world's largest telecom carrier, launched the world's first satellite to test 6G architecture. It was successfully placed into a low orbit to "offer low latency and high data transfer rates", according to an official statement. Using domestic software and hardware, the autonomous 6G architecture was jointly developed by China Mobile and the Innovation Academy for Microsatellites of the Chinese Academy of Sciences (IAMC), yet another example of industry and top scientific institutions working towards clearly defined objectives. Academia is also closely involved in this effort as we have written (see "Patents zoom but where is the innovation?", *Down To Earth*, December 16-31, 2023).

If one is looking for the Chinese way to excellence it can be found in the IAMC system—the very antithesis of the situation in India, where moribund scientific institutions are unable to shake off the legacy of a hierarchal bureaucratic system of working that produces very little of merit. Industry flounders on its own.

A little digging revealed some interesting details about IAMC. It is just one of the major microsatellite innovation research institutes in the country, focused on development of micro satellites and related innovation. So far, IAMC has launched 95 satellites into the space and emerged as a leader in the commercial satellite industry. The more fascinating revelation is that IAMC has around 700 staff for scientific research and administration work, of whom the majority are postgraduates and holders of doctorates. Now, hold your breath: the average age of the staff is just 34. Could any of the patents that these institutions have garnered be termed junk?

There are some unique aspects to China's staggering technological breakthroughs. The World Intellectual Property Organization (WIPO) notes that first and foremost, there is an emphasis on forward engineering. In this system, new or nascent scientific and technological knowledge is acquired in university labs and then applied in a top-down fashion for the development of commercial products. This is in sharp contrast

to the reverse engineering approach adopted by South Korea and Taiwan which became powerhouses of technology much earlier than China. Secondly, China has made it a policy to acquire technology and brands through international mergers and acquisitions, and lastly, it has used parallel learning from foreign direct investment firms to promote domestic companies. WIPO calls this "Beijing model" of innovation. Firms like Huawei and ZTE were set up in a university and became leading global OOBMs or original brand manufacturers. Similarly, China has produced three giants—Baidu, Alibaba and Tencent—in the platform business which WIPO says are leading the country into what it terms the era of the Fourth Industrial Revolution. There is, however, a difference. Many Chinese universities run their own businesses, which

differ from ordinary spin-offs. The university sets up the companies and also funds and staffs them, which means it retains managerial control.

A more spectacular revolution, and transformational from the environmental aspect, is in electric vehicle (EV) manufacture with Chinese firm BYD—it stands for Build Your Dreams—overtaking

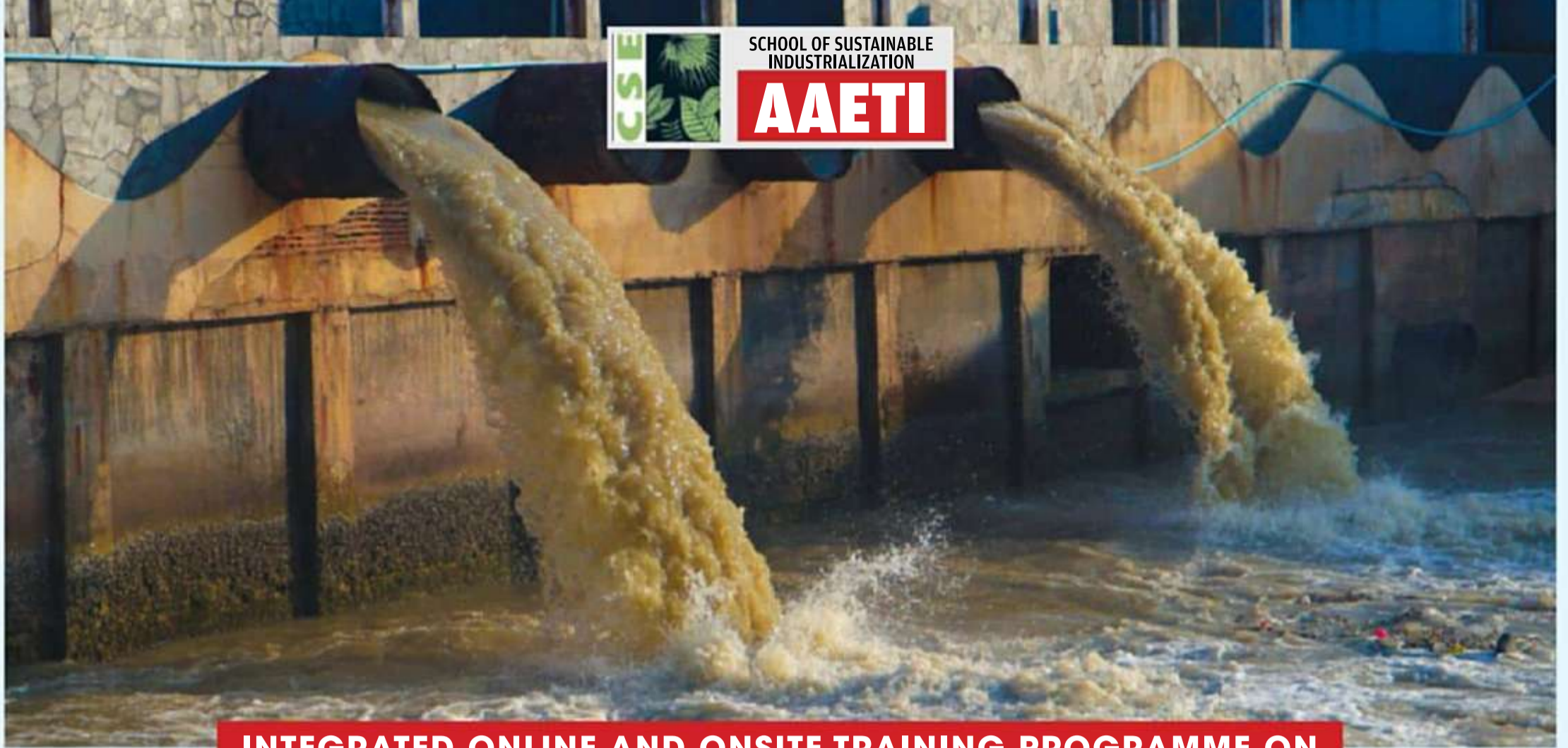
Tesla in the number of EVs it manufactures, dominating both the domestic and export markets. But more on this another time.

To come back to India's touchy relations with its neighbour, there is a new cause of friction over mobile phones, this time more serious. India has recently arrested Chinese and Indian executives working in Chinese smartphone company Vivo, accusing them of being involved in money laundering activities. A Beijing Foreign Ministry spokeswoman while promising full support to the arrested Vivo employees in "safeguarding their lawful rights and interests", has asked India to recognise the mutually beneficial nature of business cooperation between the two countries and "to provide a fair, just, transparent and non-discriminatory business environment".

Till then China is no longer sending its nationals to oversee operations here. As a result, India's export of smartphones is taking a big hit. Does it ring any bells? **DTE**

While the world is overawed by China's scientific and technological breakthroughs, albeit with trepidation, Indians tend to act like ostriches

⊗@ljishnu



INTEGRATED ONLINE AND ONSITE TRAINING PROGRAMME ON

WATER AUDIT AND WASTEWATER MANAGEMENT IN INDUSTRIES

Centre for Science and Environment (CSE) is launching an integrated training programme on Water Audit. The training programme will comprise of two parts: Basic learning (online platform) and Advanced learning (at our residential campus). The course is designed to provide an overall understanding of the water audit process which includes theoretical knowledge via lectures from sector experts, first-hand experience through group exercises, discussions, exposure visit to industries.

PART (A)

BASIC LEARNING (ONLINE)

February 6-19, 2024

- Introduction to water audit
- Instruments used for water auditing
- Basics of water circuit diagram
- Fundamentals of Cooling towers, and Boilers
- Concept of water costing
- Highlights of CGWA notification
- Industrial wastewater management
- Case studies and assignments

Note: The training will be conducted on Moodle Platform where participants will be provided with the reading /audio-visual training material.

The course material be for the duration of 2 hrs per day and live sessions will be on weekends for discussions.

PART (B)

ADVANCE LEARNING (ONSITE)

May 7-10, 2024

- Advance concepts of water accounting
- Monitoring and Metering in industries
- Preparation of Water Audit Questionnaire
- Concept of water positivity, neutrality in industries
- Increasing COC of cooling towers
- Concepts to enhance boiler, pumps efficiencies
- Achieving ZLD in Industries
- Sector specific Case Studies

Venue: Anil Agarwal Environment Training Institute (AAETI), Neemli, Rajasthan.

The 4 day's training will have sessions from sector experts, followed by class exercises and industry exposure visit.

Course fee

Part A:

Registration closed

Part B:

₹28,000/-

(Indian participants)

Training material for Part A will also be provided

AWARD OF CERTIFICATES

Certificate of completion will be awarded.

WHO CAN APPLY

Industry professionals, EHS officials, Environmental Consultants, Engineers, Regulators, Environmental laboratories, Academic institutions, Students, Research scholars, and others aspiring to work in the field of water.

For any query, contact: **Shobhit Srivastava**, Deputy Programme Manager
Centre for Science and Environment, 41, Tughlakabad Institutional Area, New
Delhi-110062 | Ext: 383; Mobile- +91-9711049558 | Fax: 011-29955879

Palette

WHAT'S INSIDE

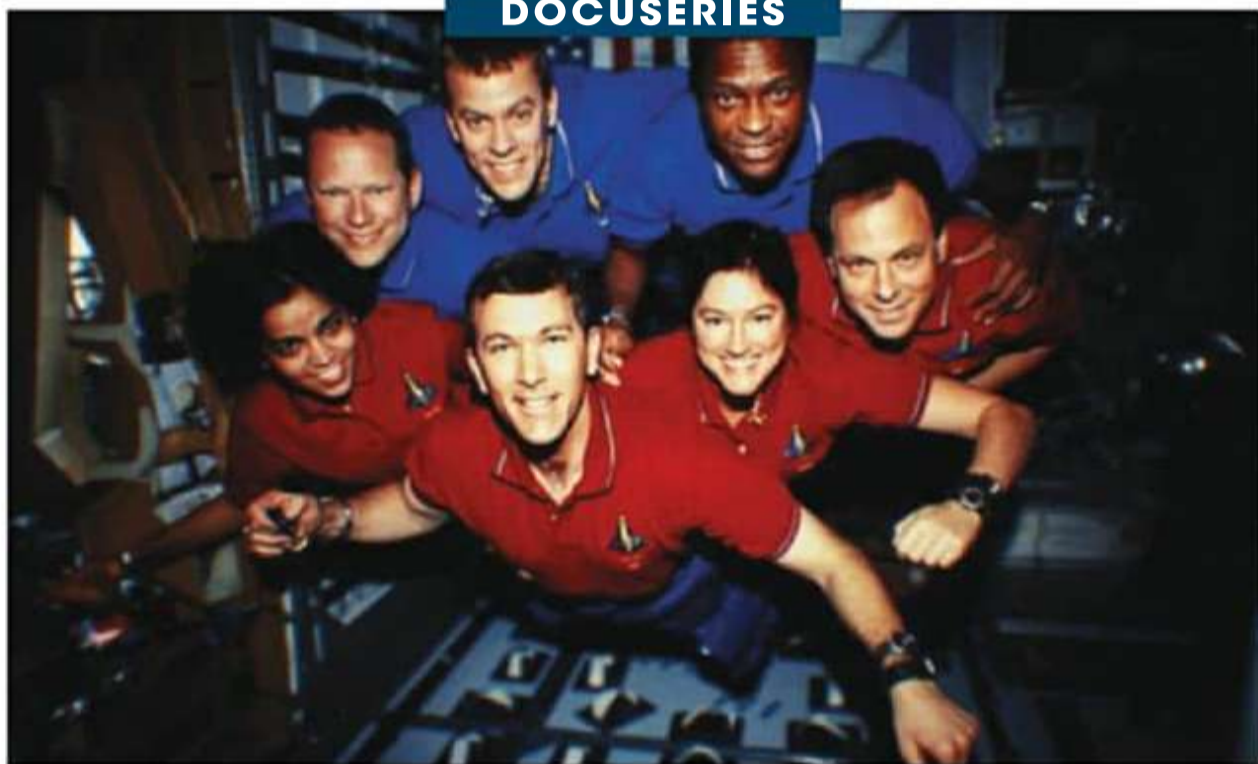
How to ensure that farmers benefit from teak planting **P50**

A note of caution against a new technology that risks privacy **P54**

Shankhalu is a sweet and healthy root vegetable **P56**

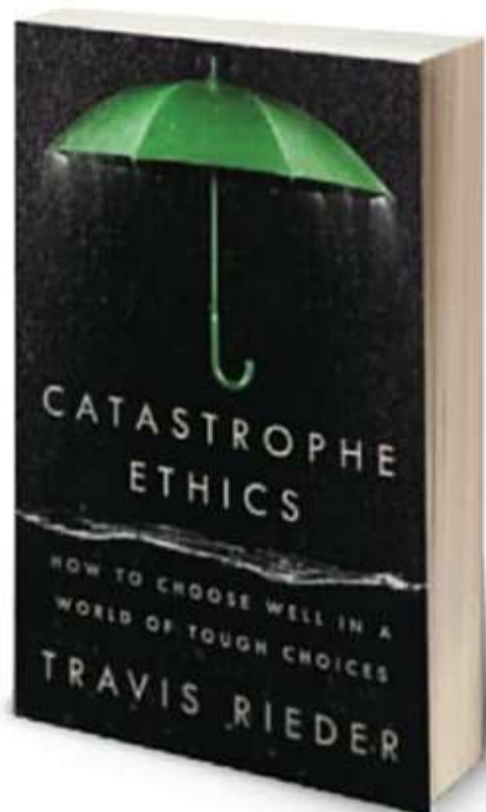
RECOMMENDATIONS

DOCUSERIES



On February 1, 2003, US space agency NASA's space shuttle Columbia disintegrated while re-entering the Earth's atmosphere. All seven crew members on board—including Kalpana Chawla, the first Indian woman to go into space—were killed in the disaster. Two decades later, in a bid to commemorate their journey and to understand what really happened to the space shuttle, the British Broadcasting Corporation (BBC) presents *The Space Shuttle That Fell To Earth*. The docuseries combines archival footage of the Columbia mission along with interviews of the astronauts' families and associates. All three episodes are now available on the *BBC iPlayer*.

BOOKS



Moral dilemmas experienced today are quite different from those our earlier generations faced. Can small commitments like avoiding plastic water bottles really make a difference when bigger industries continue to pollute and emit greenhouse gases? Theories put forward by the great philosophers of the past do not always help answer such questions. In *Catastrophe Ethics: How to Choose Well in a World of Tough Choices*, academic Travis Rieder explores how to navigate through these ethical questions in a warming world.



As the world sees more and more disasters and newer consequences of climate change, people are taking to the streets to show their demand for action—more often than not, without resorting to violence. In *Sorry for the Inconvenience But This Is an Emergency*, child psychiatrist and UN health consultant Lynne Jones explores how non-violent climate activism is growing and evolving, particularly in the context of the UK and organisations like Extinction Rebellion.

TROUBLED TEAK

Farmers need to be sensitised about right planting materials and cultivation techniques to benefit from high-value teak plantations

SANGRAM B CHAVAN AND A R UTHAPPA

TEAK HAS been the flagship species of plantation activities in India. In fact, teak cultivation has been linked to generating substantial income not only for large landowners but also for small and marginal farmers. The rush to set up teak plantation began after the National Forest Policy 1988 was formulated. The policy imposed a ban on the felling of green trees in government-owned forests and

recommended meeting the timber demand from private lands. Soon, the prices of teak (*Tectona grandis*) logs, valued for a variety of commercial purposes including high-end furniture, soared by over 500 per cent.

To cash in on this opportunity, many nursery owners and private agencies came up with teak planting schemes. Records indicate that thousands of companies operated in the market to



promote such schemes in India. Companies promoted tissue culture saplings, claiming that they would earn three to five times more profit than the plants grown using traditional methods from seeds and stumps. Returns were assured in the shortest time span of eight to 12 years. Some companies sold teak saplings at ₹400 to ₹2,500 each and promised returns of ₹50,000 to ₹1,00,000 per tree after 20 years. Such advertisements attracted thousands of farmers to invest in teak plantations, particularly from the rural regions of Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Madhya Pradesh. States such as Madhya Pradesh rolled out plantation subsidies, prompting farmers to plant teak with high density. Some private nursery owners also passed off teak seedlings as tissue culture plants. Even today, in the name of tissue culture, seed-originated teak saplings are being sold at ₹100-₹250 and are claimed to provide a yield of 1 cubic metre (m³) of timber per tree in eight to 12 years, at a density of 2,500-4,000 trees per hectare.

However, after the assured holding period, farmers invariably feel cheated due to underdeveloped and poor growth of teak plants. Our analysis shows that poor planting stock and lack of proper practices for raising and managing teak plantations have led to such poor returns from this valuable timber.

PROVENANCE V VARIETY

Many nursery owners and private companies sell teak seedlings claiming that they are Burma teak, which supposedly grows rapidly and can be harvested in eight years. Even online shopping sites like Amazon and Flipkart sell Burma teak seeds. But it is important to use

seeds or planting materials that have originated in that particular geography—also known as provenance. As S Kedarnath, the father of forest genetics in India, says: “Use seed from the local source until another source or provenance proves superior to the local one”.

That is why tree improvement programmes in forestry globally focus on the plus tree concept, which denote exceptional individuals found in natural populations or human-made plantations with desirable traits like straight bole, self-pruning, high wood quality, and resistance to pests and diseases. Based on factors such as wood quality, growth rate, stem form, seed characteristics and response to climate and soil conditions, three

TEAK GROWERS ARE UNAWARE OF THINNING PRACTICES, WHICH LEADS TO HIGHLY DENSE PLANTATIONS AND UNSATISFACTORY GIRTH OF THE TIMBER

primary provenances of teak exist worldwide: the Indian Peninsular, the Burmese-Thai-Laos and the Insular (Indonesian). In India, teak displays distinct traits influenced by local climates and soil conditions. For example, along the Malabar coast in the Western Ghats, teak thrives due to ample rainfall and is ideal for ship and boat construction. The teak growing in central India is prized for specific qualities suitable for furniture and aesthetics. Teak wood from Seoni in Madhya Pradesh boasts a golden yellow hue blending heartwood and sapwood. Chandrapur in Maharashtra produces exceptional teak renowned for its colour and texture, owing to distinct growth rings. The Godavari valley in Andhra Pradesh offers teak suitable for decorative furniture and cabinet making. Similarly, teak from Rajulmadugu, also

in Andhra Pradesh, is valued for its valuable pink-coloured heartwood. The Forest Development Corporation of Maharashtra produces and sells high-quality planting material for plantations to benefit farmers.

SANS STANDARD PRACTICE

The concept of commercial tree planting in India was introduced during the colonial rule and later disseminated by the forest department. Typically, 2,500 teak trees are planted on a hectare, at a density of 2m x 2m, and this is followed by a prescribed thinning protocol. Thinning involves selective removal of teak saplings, with 50 per cent harvested after four to five years and 50 per cent of the remaining after eight to 10 years. The

technique targets poorly shaped, forked, dead, broken and diseased trees, leaving around 100-150 trees with straight boles, knot-free and high economic value, yielding 1 to

2 m³ of wood volume. Forest departments follow thinning intervals of five, 10, 15, 20, 25, 30, and 40 years.

Farmers are, however, often unaware of thinning practices. This results in underdeveloped teak stands after 15 years. Highly dense plantations also lead to unsatisfactory diameter of the plants with girths of 10-15 cm.

Nowadays, irrigation, soil management and additional inputs enhance tree growth. But due to delay in thinning, some plantations fail to achieve the girth increment commensurate with the inputs. In fact, the prime reason for failing teak plantations or poor earnings from the plantations is close spacing without prescribed thinning practices. We had observed this during a 2019 visit to teak plantations in Madhya Pradesh. The farmers expressed disappointment with

the size of their teak plants even after a decade. Similar issues were observed in Uttar Pradesh, Maharashtra, Telangana and Chhattisgarh, indicating widespread challenges that teak plantations face in the country.

In India, only a few institutions have developed teak-based agroforestry systems, prescribing varied spacing and pruning techniques for optimal growth. Scientific management practices highlight the importance of pruning and thinning to enhance growth and quality. However, farmers frequently neglect these measures, leading to reduced tree volume and prolonged growth periods. Despite numerous schemes and advertisements, no comprehensive manual is available on successful teak cultivation in farms.

PRODUCTIVITY PUZZLE

Farmers often fall victim to deceptive claims made by private entities, roping them into fraudulent schemes. This situation underscores the significance of addressing misinformation and fraudulent practices within the agricultural sector. For instance, private nursery and tissue culture laboratory stakeholders usually give projections that maintaining a density of 800-1,000 trees per hectare up to 12-15 years, produces 0.8 to 1 m³ of wood volume per tree. This means a farmer can harvest 700-1,000 m³ of wood per hectare.

The fact is that teak forests in India have an average yield of 2-5 m³ per hectare and potential yield of about 10 m³ per ha. For best growth, teak needs deep, well-drained and fertile soils with an optimum pH of 6.5 to 7.5. Prime-quality teak, found in Myanmar and Kerala, is obtained after 50-60

years under ideal conditions and can produce 1 m³ wood per tree. Such high yield can be obtained only if best climatic and edaphic conditions are provided.

In the Asia-Pacific region, teak is typically cultivated with extended rotation periods spanning 35 to 80 years, yielding annual productivity between 5 and 20 m³ per hectare. Meanwhile, teak plantations in Africa commonly undergo shorter rotations of approximately 20 years, resulting in lower productivity, which ranges from 4 to 13 m³ per hectare annually.

ONLY A FEW INSTITUTIONS IN INDIA HAVE DEVELOPED TEAK-BASED AGROFORESTRY SYSTEMS. NO COMPREHENSIVE MANUAL IS AVAILABLE FOR FARMERS ON SUCCESSFUL CULTIVATION OF TEAK ON FARMLAND

Teak experts from Malaysia suggest that by carefully selecting sites and using appropriate practices, the annual yield could reach 8-12 m³ per hectare. They caution against claims of yields higher than 15 to 20 m³ per hectare within 20 years using current methods.


In 2019, we, along with a few other scientists from the Indian Council of Agricultural Research-Central Agroforestry Research Institute in Jhansi, harvested 32 trees from a teak plantation in Raisen Division of Madhya Pradesh managed for 25-30 years. The volume varied from 0.26 m³ to 0.36 m³ per tree. Another 25-year plantation harvested from farmers' field at Baramati in Maharashtra also yielded 0.15-0.30 m³ per tree. A 2021 study showed that a well-managed teak agroforestry (planted at 2m x 2m density and thinned at four years) produced 0.96 m³ per tree after 25 years. Based on this, it

can be concluded that with appropriate spacing, tree density, pruning, thinning and plant protection, a teak tree of 25 years can yield 0.25-0.30 m³ of wood.

Marketing is the other crucial issue for the farmers. Despite being the largest teak-growing country, India imports 60 per cent of teak logs to meet local demand. The market rate of 1 cubic foot (0.028 m³) of teak timber is ₹700-4,000 based on grade and quality. Even today, many government teak depots sell teak wood at ₹30,000-60,000 per m³, depending on the

length and girth of a log. But on private farms, teak harvesting faces stringent rules. Even after simplifications of rules, the forest department drags its feet on granting permission to harvest trees. This situation favours private saw-

mill owners or traders who quote the lowest rates to teak growers. In Maharashtra, a sawmill purchased teak trees at ₹5-10 per kg of dried wood, which means barely ₹500-1,500 per tree. Some even quote a lump sum amount, which includes charges of harvesting permission.

There is an urgent need to sensitise farmers about cultivation techniques as well as effective marketing strategies. In addition, quality planting material from certified forest nurseries will help them realise the true value of teak. 

@down2earthindia

(Sangram B Chavan is senior scientist, agroforestry, with the National Institute of Abiotic Stress Management, Baramati, Maharashtra, under Indian Council of Agricultural Research (ICAR).

A R Uthappa is scientist, agroforestry, with ICAR-Central Coastal Agricultural Research Institute, Ela, Goa)



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AI can see you

A sophisticated and frightening face-recognition algorithm being employed by technology firms could be the end of privacy as we know it

ROHINI KRISHNAMURTHY



Your Face Belongs to Us: The Secretive Startup Dismantling Your Privacy

by Kashmir Hill

Publisher: Simon & Schuster UK

MRP: US \$30 | Pages: 352

WHEN KASHMIR Hill, a technology journalist at *The New York Times*, tried on a pair of chunky augmented reality glasses in 2021, she caught a glimpse of what a sophisticated technology could unleash on a world that is not prepared to handle it. The glasses were no ordinary gadget; they revealed to the wearer the identity of any individual seen in the frame. They also displayed photos of the person uploaded on the internet, along with data on where they were clicked.

Powering these augmented reality glasses is an artificial intelligence algorithm designed by Clearview AI, a New York city-based facial recognition technology startup, founded in 2017. The company would go on to sign a contract with the US Air Force to research augmented reality glasses to help with security on military bases. Hoan Ton-That, an Australian national who is the CEO and co-founder of the company, tells Hill that the idea behind the gadget was to help soldiers decide whether someone standing at a distance of 15 m was dangerous or not.

But concerns over the technology's possible misuse are largely ignored by the entrepreneur, who is keen on convincing people why they need to make their faces

available for the world to see. This is something that Hill effectively brings out in her book *Your Face Belongs to Us*.

The book is largely a documentation of Hill's investigation of Clearview AI, except for two chapters that are dedicated to Facebook and Google's entry into the facial recognition space, and their exit from it, fearing repercussions. Hill also makes an interesting point about how Clearview AI managed to beat Google and Facebook in the game despite these companies possessing vast databases on people's photos and names. These giants, she says, were wary of the consequences while Clearview AI, being a new entrant, did not have much to lose.

Hill's first encounter with Clearview AI was in 2019 when the startup was making a splash with law enforcement agencies in the US. A tip about a mysterious firm capable of identifying a person with just a snapshot of their face caught her attention. After relentless sleuthing, multiple dead ends and several interviews of people involved in the business, Hill managed to lift the veil on the startup, which would have otherwise preferred to work minus media scrutiny.

The author gives her readers a peek into the tech entrepreneur's mind by tracing Ton-That's past—from his growing-up years in Melbourne, Australia, where he taught himself to code at the age of 14 years to his move to San Francisco, US, where he dabbled with building apps. He finally tasted success with Clearview AI, which he co-founded with Richard Schwartz, an aide to Rudolph W Giuliani when he was mayor of New York. Schwartz helped

Ton-That secure investments.

In a blog published on Clearview AI's website, Ton-That passes off facial recognition technology as something innocuous by calling it "Google for Faces". He goes on to say that his algorithm uses publicly available photos, instead of keywords, to provide results. To identify a person, the technology compares an uploaded mugshot with a database of 20 billion photos that were scrapped from sites like Facebook—without the consent of users. All of this was to sell the software to private companies, hotels, luxury condos or retail stores to keep out thieves or strangers. In 2020, the company

TO IDENTIFY A PERSON, THE TECHNOLOGY COMPARES AN UPLOADED MUGSHOT WITH A DATABASE OF 20 BILLION PHOTOS THAT WERE SCRAPPED FROM SITES LIKE FACEBOOK—WITHOUT THE CONSENT OF USERS

changed gears, finding its calling in fighting crimes—from petty violence and property disputes to human trafficking and child abuse. The company then decided to sign contracts exclusively with governments and law enforcement agencies.


Though Clearview AI's algorithm was rated by the National Institute of Standards and Technology, an agency of the US Department of Commerce, as the world's second-most accurate in recognising faces in the country, it is far from perfect. For instance, Hill explains that a 28-year-old African American man in Georgia was wrongfully arrested after Clearview AI's algorithm mistook him for another person who used stolen credit cards at consignment stores in Louisiana. This was

hardly the first case of an innocent person paying the price for humans making decisions based on a not-so-perfect technology. Facial recognition systems are notorious for making errors while identifying African Americans and women.

Hill also highlights a case of a technology enthusiast using facial recognition software to trace the real names and addresses of adult film actors. No one could have stopped the individual from stalking, hurting or assaulting these women he found on pornographic websites. In the wrong hands, the technology can lead to more crimes.

Ton-That explains that his algorithm was used to help identify the people who attacked the Capitol on January 6, 2021, to disrupt the affirmation of the US presidential election results. Government agencies in Ukraine have been said to be using this technology against the Russian invasion. But it is quite evident that the technology is imperfect and even dangerous in absence of regulations.

Hill's book also raises concerns over whether firms like Facebook will join the bandwagon again in the future. She warns that the social networking giant has not ruled out the possibility of using the facial recognition algorithm in augmented reality glasses.

The author leaves her readers with a question on what it means to maintain privacy in the modern world: "Information that you give up freely now, in ways that seem harmless, might come back to haunt you when computers get better at mining it." This is something that users, companies and governments need to ponder over right now. [DTE](https://www.dte.org.in)  down2earthindia



MODERATELY YOURS

The crunchy, slightly sweet tubers of *shankhalu* can be a healthy addition to one's diet

VIBHA VARSHNEY

IT IS not easy to find *shankhalu* in the fruit and vegetable markets of Delhi unless one waits patiently for February to taste its earthy sweetness. The root vegetable, with white and crunchy flesh and slightly sweet taste, is primarily grown in West Bengal, Odisha, Bihar and several northeastern states, and is available around Vasant Panchami, a Hindu festival that marks the beginning of spring. In some states, particularly in West Bengal, where goddess Saraswati is worshipped on the occasion of Vasant Panchami, the tuber is one of the fruits offered to the deity.

Studies show that *shankhalu* or yam bean is effective in controlling metabolic syndrome and preventing development of diabetes and obesity caused by a high-sugar diet

The turnip-shaped root vegetable with striations on its light brown papery skin resembles a conch or *shankh* that the goddess holds.

The plant, also known as yam bean, jicama and Mexican turnip, is not native to India. Rather, it is native to tropical America; the first yam bean plant to be described by Carl Linnaeus, the father of taxonomy, in 1753 was a species from Mexico and is known as *Pachyrhizus erosus* in scientific lexicon. So far, taxonomists have identified five species of the yam bean, of which three—*P erosus*, *P tuberosus* and *P ahipa*—are cultivated for their tuberous roots



in Central America, China, India, Southeast Asia, Bangladesh, the Caribbean, French Guiana, Brazil and Central and West Africa.

The genus *Pachyrhizus* has several characteristics that establish it as a sustainable crop for the tropics and sub-tropics. For instance, the plant, a perennial vine, grows easily and is drought resistant. Unlike other yams such as the elephant foot yam and colocasia, yam bean plants can fix atmospheric nitrogen and enhance soil fertility.

The tuber is also known for its health benefits. Jicama might look like a potato, but it is not as starchy and has fewer carbohydrates. Its texture is crunchy and juicy, similar to that of a pear or water chestnut, and it is slightly sweet. According to the US Department of Agriculture, 100 g of the yam bean contains around 90 per cent of water and 4.9 g of fibre. The root is also rich in micronutrients; 100 g of the yam bean contains as much as 150 mg of potassium. A study published in the journal *Antioxidants* in November 2021 states that more than 50 phytochemicals have been reported from the plant, which belong to different chemical classes such as triterpenoids, organic acid, flavonoids and fatty acids. These chemicals are known for antioxidant, immune modulation, anticancer, anti-diabetes, anti-osteoporosis, antiviral, and anti-ageing properties.

Raw yam bean is also a rich source of fructooligosaccharides and inulin, which provide the sweet taste to the tuber. Fructooligosaccharides and inulin are inert carbohydrates and do not turn into simple sugars when broken down by digestion. This is good news for those with diabetes; eating this root will not lead to fluctuations in

RECIPES CHAAT

INGREDIENTS

Shankhalu: 2, medium-sized
Carrot: 2, medium-sized
Cucumber: 1
Coriander: 1 small bunch
Mint: 1 small bunch
Green chillies: 2 to 3
Mustard seeds: 1 tsp
Lemon: 1
Red chilli powder: 1/2 tsp
Salt to taste

METHOD

Grind the coriander, mint, green chillies, mustard seeds and salt to prepare a chutney. Keep aside. Peel and cut the *shankhalu*, carrot and cucumber to equal-sized pieces. Add a spoon or more of the chutney to the salad, adjust the salt, add red chilli powder and squeeze lemon juice over it. The spicy and crisp *chaat* is ready to be enjoyed as a snack.

JICAMA FRIES

INGREDIENTS

Shankhalu: 2 large tubers
Oil for frying
Salt and pepper to taste

METHOD

Peel and cut the tubers into French-fry like sticks. Take oil in a pan and fry the sticks until they are golden brown and crispy on the outside. Add salt and pepper and mix well.

blood sugar levels. Several studies involving animal models have found that the root crop has been effective in controlling metabolic syndrome and preventing the development of diabetes and obesity caused by a high-sugar diet. In a study published in *Journal of Advanced Veterinary and Animal Research* in April 2019, mice were fed with fibres

isolated from the root for eight weeks. The researchers found that supplementation of 25 per cent of the diet with the fibres significantly prevented the blood glucose increase, excessive body weight gain, and glucose intolerance caused by high sugar diet. Another study, published in *Cosmetics* in December 2023, shows that the root extracts protect from obesity. The study results indicate that the yam bean extract has excellent carbohydrate-digestive enzyme inhibitory effects, suggesting its potential use as a functional food ingredient for diabetes and obesity prevention.

In almost all the countries where the vine grows, yam bean is part of the street food. In Mexico, the roots are sold roasted, baked and even grilled. In India, the tuber, also known as *misrikand*, *kesaru* and *sankesh*, is eaten raw or mixed with spices (see recipes).

Despite multiple benefits, farmers in India still rely on traditional landraces as breeding efforts have not received much attention from researchers. The Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala, and centres under the All India Coordinated Research Project on Tuber Crops maintain over 60 germplasm accessions from different parts of India.

Though the roots of the plant are edible, the seeds, leaves and stems are poisonous. They contain a chemical rotenone that is moderately toxic to humans and can even lead to death, as per the World Health Organization. Rotenone is used as an insecticide to control aphids. While this does suggest caution in case people accidentally consume the seeds, it also means that yam bean provides two products that can keep humans and plants healthy. **DTE**

🌱 @vibhavarshney

Few farms, fewer farmers

THE VOCATION of agriculture is undergoing a civilisational change. The number of farms in the world is declining, while the farm size is increasing. Does this imply consolidation of farming in the hands of a few?

Some 12,000 years ago, when settled agriculture began, it was a need-based activity. Today, it is a multi-trillion dollar enterprise with 600 million farms feeding the world's 8 billion people. But this vocation is fast undergoing a change. Recently a researcher from the University of Colorado Boulder, US, analysed the number and size of farms in 180 countries from 1969 to 2013, and used the trends to forecast the situation in 2100. The study, published in *Nature Sustainability*, found that by 2100, the number of farms in the world would halve while the size of farms would double. In the US and Western Europe, this trend has been observed for decades. "Early 20th century agriculture was labour intensive, and it took place on many small, diversified farms in rural areas where more than half the U.S. population lived. Agricultural production in the 21st century, on the other hand, is concentrated on a smaller number of large, specialized farms in rural areas where less than a fourth of the U.S. population lives," says the Economic Research Service of the US Department of Agriculture. Number of farms in the US has been declining since 1982—from 2.20 million in 2007 to 2 million in 2022. The average farm size, however, increased from 176 hectares (ha) in the 1970s to 178 ha in 2022.

The University of Colorado Boulder study forecasts that farm creation will stop and consolidation will set in by 2050 in Asia, West Asia, North Africa, Oceania, Latin America and the Caribbean, while sub-Saharan Africa will witness the change towards the end of the 21st century. In these regions, agriculture is the dominant employer with the majority of the farmers being small landholders. Even if the farm number remains unchanged, the study warns, fewer people will own land and farms.

There are three key consequences of this change. One, consolidation of farming in the hands of a few, probably big corporations or powerful individuals. Two, large farms mean a rise in monoculture farming and reduction in crop diversity, which will impact overall food and nutrition security. Three, the sector will be more susceptible to risks. "If you're investing in today's food systems with around 600 million farms in the world, your portfolio is pretty diverse. If there's damage to one farm, it's likely that the impact to your portfolio will be averaged out with the success of another. But if you decrease the number of farms and increase their size, the effect of that shock on your portfolio is going to increase. You're carrying more risk," Zia Mehrabi, the author of the study, was quoted in a newspaper.

For a country like India (and for that matter

Will the few producers, controlling our farms, also control our food and nutrition security?

most other poor and developing countries in Asia, Africa and North America), this is a change that we never imagined, and thus, are not prepared for the consequences. For instance, the number

of operational farm holdings in India has been increasing—from 71 million landholdings in 1971, it has fragmented into 146.5 million holdings, according to the latest Agriculture Census 2015-16. This small size of landholdings is the chief cause of low crop yields and explains the unilateral focus of agri-policies to boost productivity. This must change once India starts reflecting the global trend.

The fact is that agriculture still contributes significantly to the economies of poor and developing countries. In India, agriculture's capacity to reduce poverty (and hunger) has been much more than that of sectors like services and industry. So the big questions are: if agriculture gets consolidated in the hands of a few, will the non-farm sectors be able to absorb the millions moving out of the farm sector? Will the few producers then also control our food and nutrition security? [DTE @richiemaha](https://twitter.com/richiemaha)

RESIDENTIAL TRAINING

COMPRESSED BIOGAS (CBG) POTENTIAL, TECHNOLOGY, POLICY, OPERATIONS AND ECONOMICS

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The Indian government has set a target to raise the share of gas in the energy mix: 15 per cent by 2030 from the current 6.5 per cent. This move aims to transform India into a gas-oriented economy. Presently, India produces 34,000 million standard cubic meter of gas (MMSCM) but consumes 64,000 MMSCM, resulting in a substantial shortfall of 30,000 MMSCM. This deficit accounts for 47 per cent of the total consumption, which is fulfilled through imports. Compressed Biogas (CBG) as a domestic energy source can play a key role in addressing this gap and helping the nation achieve its clean energy goals.

The CBG production potential in India is estimated at around 62 million metric tonne, as per the Union Ministry of New and Renewable Energy (MNRE). The Sustainable Alternative Towards Affordable Transportation (SATAT) scheme aims to tap 15 million metric tonne of this. In the 2023-24 Union Budget, finance minister Nirmala Sitharaman has earmarked Rs 10,000 crore for the establishment of 200 CBG plants and 300 community and cluster-based plants. In addition to this budgetary allocation, the government has introduced several policies and initiatives to accelerate the implementation of CBG projects in India. These measures include MNRE's Waste to Energy programme, the Swachh Bharat Mission (SBM), and the Galvanizing Organic Bio-Agro Resources (GOBAR)-DHAN scheme. However, despite these policy efforts, the number of CBG plants currently installed on the ground is only 46. This slow progress can be attributed to the limited dissemination of CBG-related information among potential investors.

Centre for Science and Environment (CSE) is offering a tailor-made three-day residential training programme on 'CBG: Potential, Technology, Policy, Operation and Economics'. The high-impact training has been conceived to provide an end-to-end solution to design and install a CBG plant that aligns with the principles of circular economy, energy transition, and sustainable development.

FOR FURTHER DETAILS, PLEASE CONTACT THE COURSE COORDINATOR

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HIGHLIGHTS

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